ENGINEERING AND MINING JOURNAL

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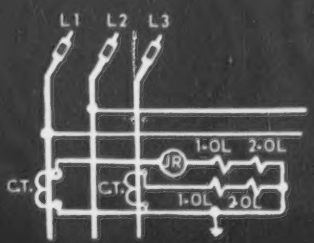
OCTOBER 1957
PRICE ONE DOLLAR

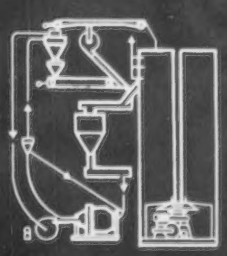
FOUNDED 1866

More dots are appearing on the mineral map as the American West demands more iron ore p 82



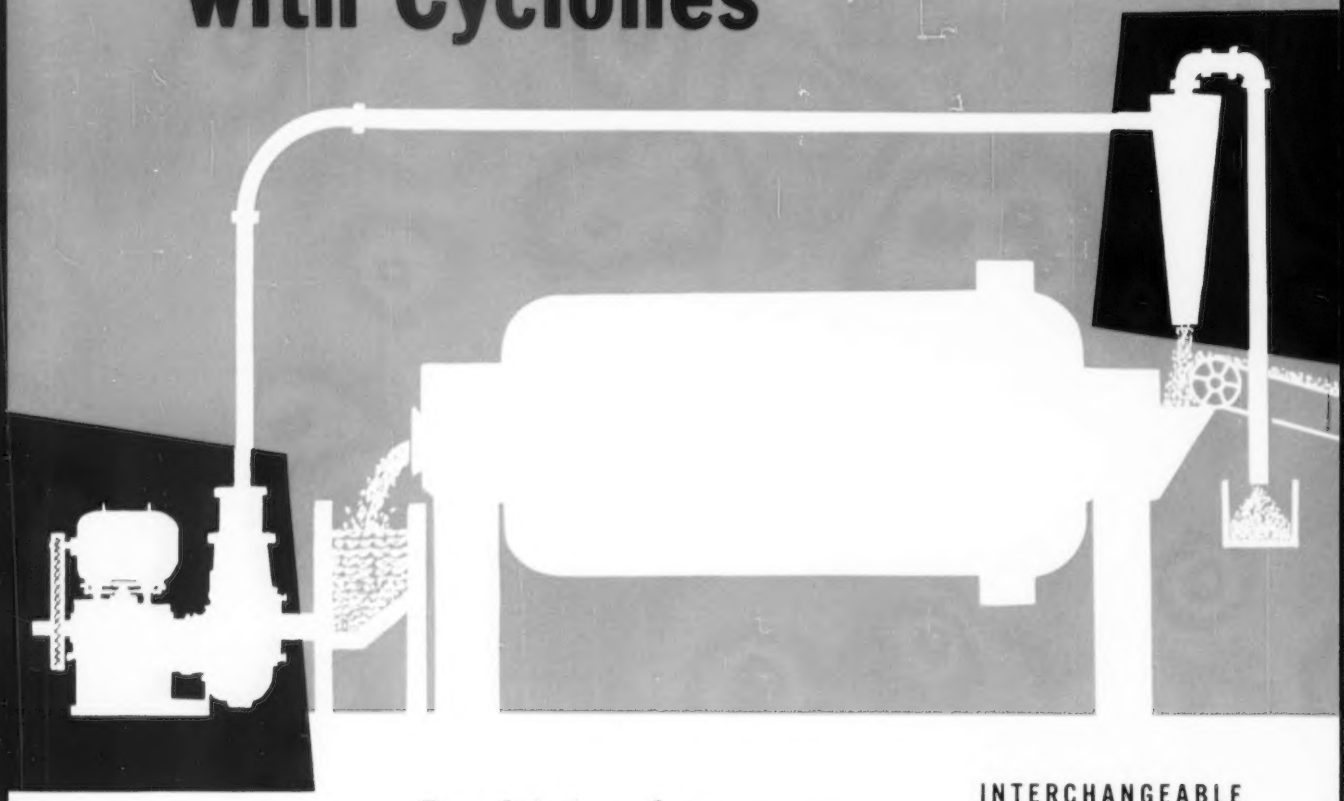
Improvements on electrical controls of crushers and grinding mills can cut your downtime p 94

Compressed-air gun is used to stow backfill in the underground workings at Rio Tinto Spain p 84



How flash roasting eliminated the slime flotation section at Electrolytic Zinc Co. of Australia p 78

A-S-H pumps keep pace with Cyclones



Beneficiation plants are actively recognizing advantages in using cyclones. More and more they are giving them the opportunity to demonstrate capacity and efficiency in process separation. Because the operators see that cyclones do their best with the help of efficient pumps, there is a marked demand for Hydroseals and, where abrasive pulp must be delivered undiluted, for Centriseals.

If you haven't seen our new, easier aids to selecting the right type and size of pumps, write for Technical Data Brochure No. 357.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives throughout the World

INTERCHANGEABLE
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HYDROSEAL
(Sealing water)

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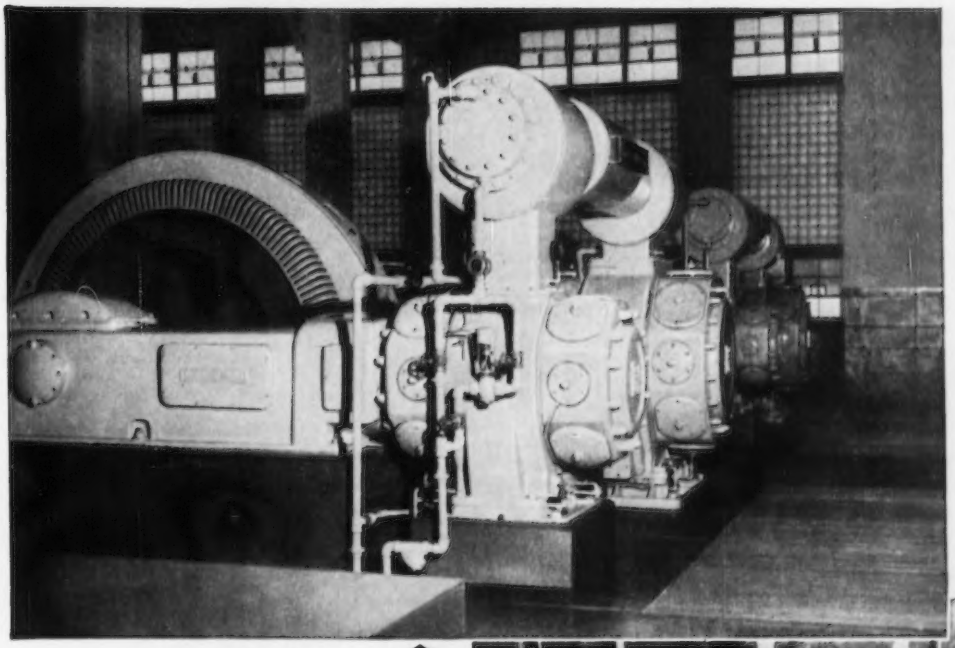
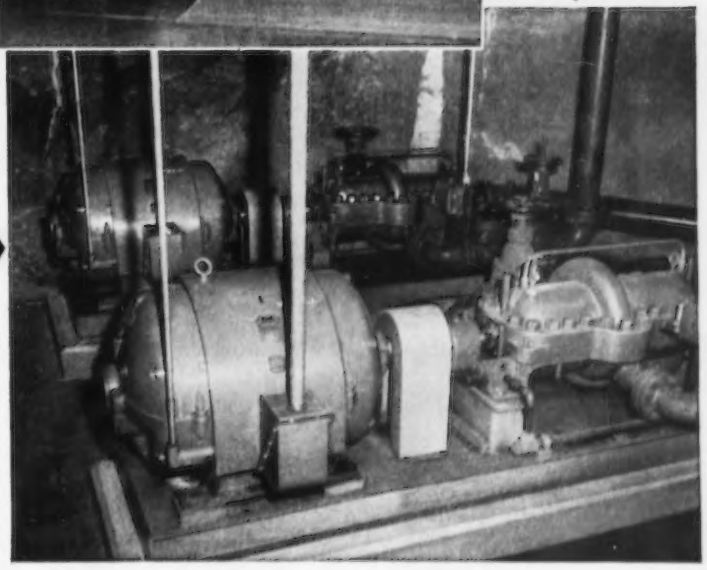
(No sealing water)

HYDROSEAL *and* ***CENTRISEAL***
SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

ON TOP or DOWN UNDER

Pumps and Compressors give TOP LEVEL PERFORMANCE at Large Underground Iron Mine





These two Ingersoll-Rand PRE compressors, installed at ground level of this large underground iron mine in the midwest have been giving dependable, trouble-free service for over six years. Each unit is rated 600 hp, 3190 cfm, delivering 100-psi air for operation of rock drills, air hoists and pneumatic cylinders throughout the extensive underground operations.

Installed way down at the 17th level, three Ingersoll-Rand CNTA pumps force mine water up to the surface. These automatically-controlled units, two of which are shown at the right, are driven by 250-hp motors and handle 600 gpm at a total head of 1300 ft.

Other Ingersoll-Rand pumps in use at this iron mine include a 800-gpm fire protection pump and three 600-gpm close-coupled Motorpumps circulating cooling water to the compressor, oil filtering system and electrotype step regulator.

FOR INFORMATION on mine pumps, compressors, rock drills, air tools, and hoists to meet your exact requirements to best advantage, call your I-R representative or nearest branch office.

Ingersoll-Rand

10-654

11 Broadway, New York 4, N. Y.

COMPRESSORS • GAS & DIESEL ENGINES • ROCK DRILLS • PUMPS • TURBO-BLOWERS • AIR & ELECTRIC TOOLS
CONDENSERS • VACUUM EQUIPMENT

ENGINEERING AND MINING JOURNAL

91st YEAR OF PUBLICATION

OCTOBER 1957

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B.F.Goodrich report:

Hose picks up a lake and moves it away

B.F.Goodrich improvements in rubber brought extra savings

Problem: That pump works night and day, draining water out of a huge excavation. It's where one of the locks is being built on the St. Lawrence Seaway. Only one trouble.

The water is loaded with clay, sand, gravel, small stones. The combination is so rough that the teeth on excavation shovels used here have to be changed several times a day. Such sharp particles would wear holes in ordinary hose or even in metal pipe.

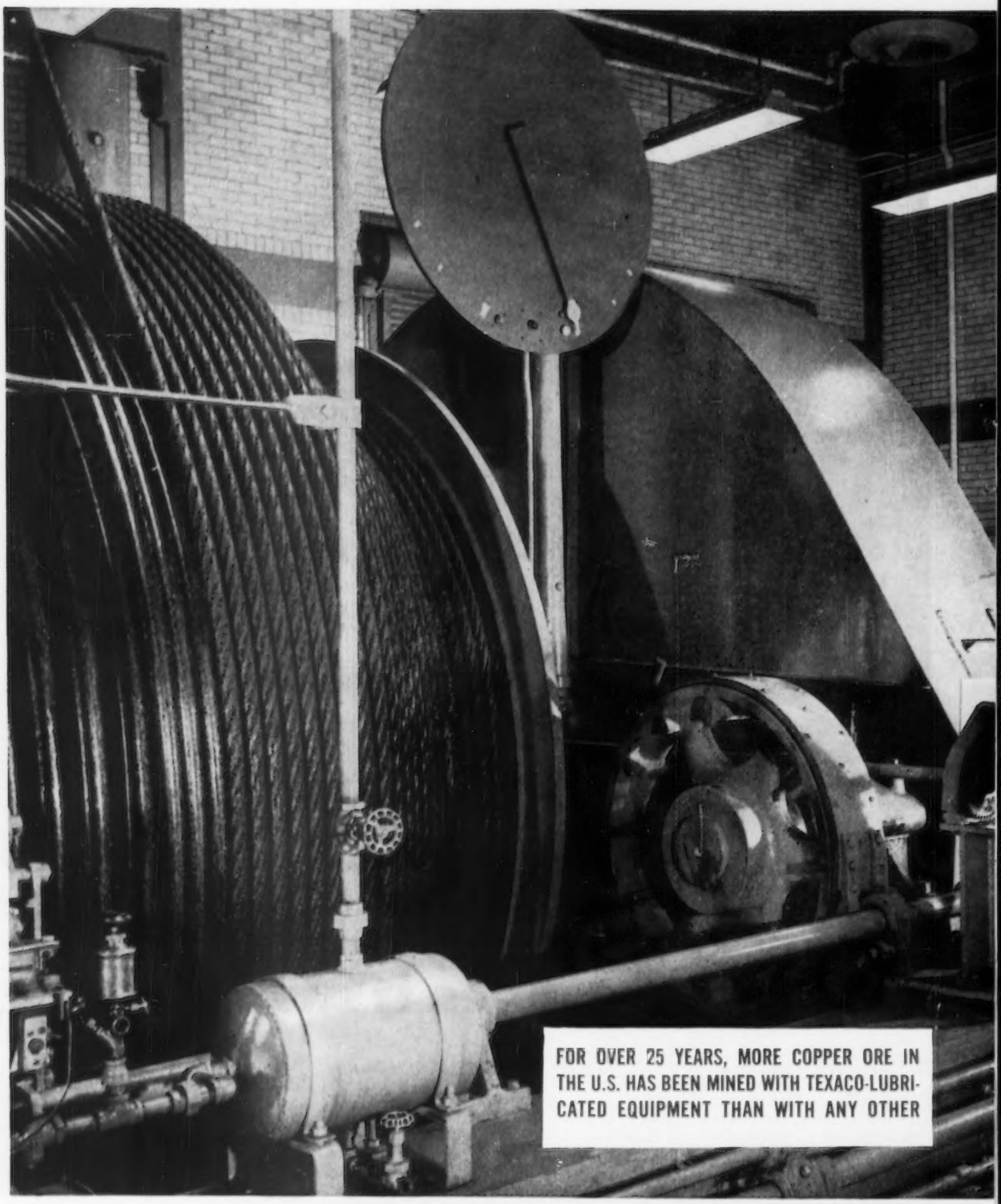
What was done: Luckily, the engineer in charge knew about a tough rubber hose, developed by B.F.Goodrich for handling other troublesome materials. The special lining in this hose is soft enough so the sharp, gritty particles simply bounce off the rubber instead of digging in and cutting it to shreds.

Savings: B.F.Goodrich hose had been on the job six months when the picture was taken. It gulps thousands of gallons of water-and-grit every day, and it's standing the abuse so well that engineers predict it will last at least two more years.

Where to buy: Your B.F.Goodrich distributor has exact specification for the B.F.Goodrich suction hose described here. And, as a factory-trained specialist in rubber products, he *can* answer your questions about *all* the rubber products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Co., Dept. M-157, Akron 18, O.*

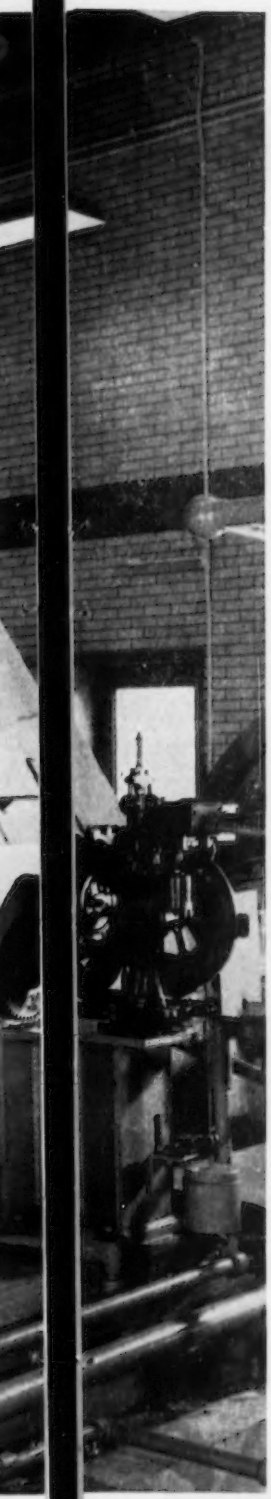
B.F.Goodrich

INDUSTRIAL PRODUCTS



TEXACO

TEXACO



Keep wire rope as strong as the day you bought it

Here's proof it can be done: *One operator (name on request) reports on a 3,100-foot wire rope that had been lubricated exclusively with* ***Texaco Crater:*** *"After some two years' service... we sent a sample of the rope to the manufacturer for testing. The report on the test showed the rope to be perfectly lubricated and to have* ***more tensile strength than guaranteed when sold to us."***

TEXACO CRATER penetrates quickly, surrounds each metal strand with a tough film that prevents rust, greatly reduces wear. In addition, *Texaco Crater* forms a protective seal around the core. This double action is what keeps rope strong longer.

Texaco Crater is also ideal for open gear lubrication. It eases the strain of extra heavy loads and minimizes wear—so gears run smoother, last longer, cost less for maintenance.

When conditions make spray application more practical, use *Texaco Crater X Fluid*. On both wire rope and gears, it does the same outstanding lubricating and protective job as regular *Crater*.

For mine car wheels, use *Texaco Olympian Grease*. It resists stiffening, even in coldest weather. Assures easier starts, full bearing protection, lower costs.

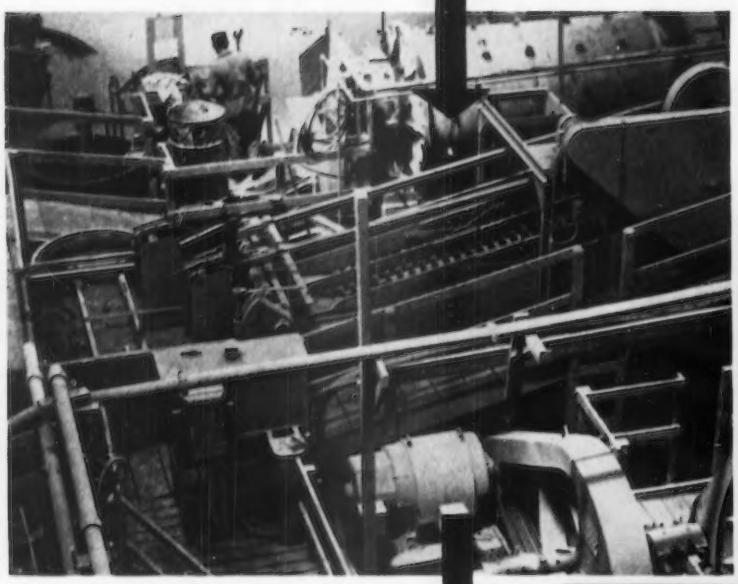
Let a Texaco Lubrication Engineer help you raise efficiency, reduce costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

☆ ☆ ☆

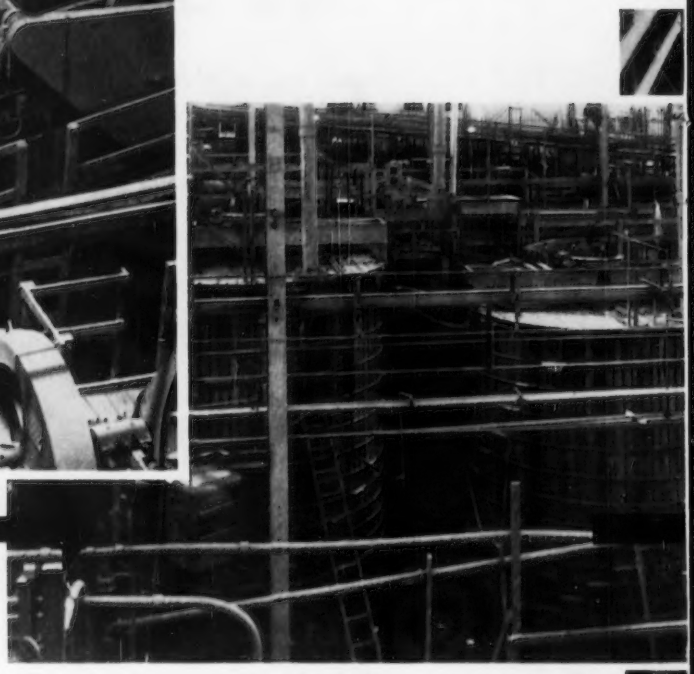
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels
FOR THE MINING INDUSTRY

Uranium Ore at Rare



1. GRINDING — DSF Rake Classifier in closed circuit with rod mill, design overflow 540 tpd containing 260 tpd solids.



2. AGITATION — Type AA Airlift Agitators in acid leach circuit, feed 540 tpd at 48% solids.

Photographs are arranged in flowsheet order to illustrate the major treatment steps from primary grinding to Resin-In-Pulp process.

Located in the desert outside of Tuba City, Arizona, Rare Metals Corporation of America, at their new 260 ton per day Uranium Ore Concentrator, is making skillful use of Dorr-Oliver equipment and techniques in the sand-slime separation circuit prior to Resin-In-Pulp process.

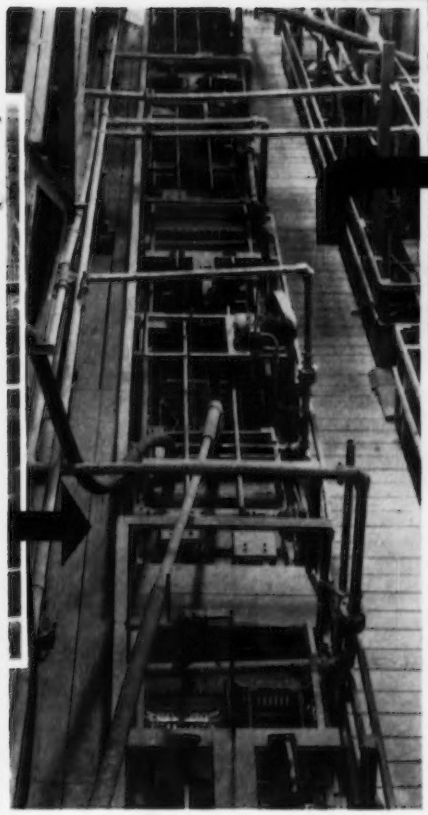
Dorr-Oliver units employed consist of one 6′ wide x 30′ long Type DSF Rake Classifier in closed circuit with rod mill preparing the non-carnotite sandstone feed for the thickening and leaching steps. In the slimes acid leaching circuit, there are two 14′ x 14′ Dorr Type AA Airlift Agitators. Four 4′ wide x 20′ long Type DSFRA Washing Classifiers wash the coarse sand fraction in counter current wash, lead Classifier overflow is cycloned in two stages consisting of three 6″ FRS DorrClones in each stage for further reduction of slimes to the RIP step.

Other D-O units include one 40′ dia. Type AA Thickener and one 30′ dia. Type A Thickener used for handling reclaimed mill water. In addition, Rare Metals has also installed several Dorr Type V Suction Pumps for metering of Thickener underflow.

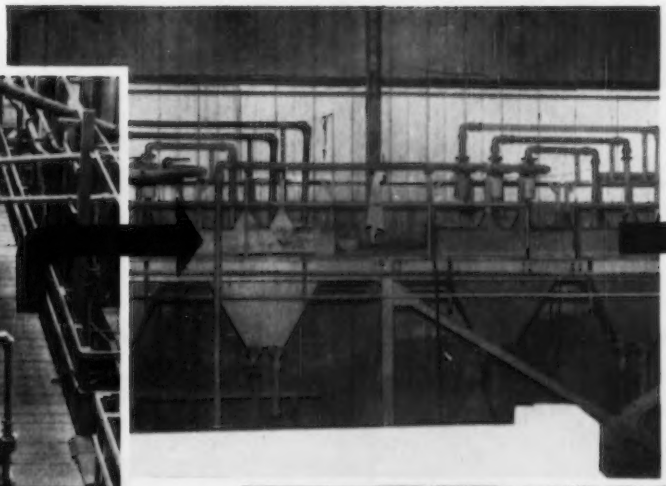
The know-how behind each unit of Dorr-Oliver equipment for the processing industries is based on worldwide experience. Whether your requirements be for individual equipment or complete design and consulting service, D-O can be of help to you.

For complete information, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

Beneficiation
Metals



3. WASHING — Acid leach residue is washed in Neoprene lined DSFRA Classifiers, separation made at 100 mesh.



4. DESLIMING — FRS DorrClone overflow derived from Classifier overflow provides 900 tpd of slurry at 10% solids to RIP Process; sand tails 236 tpd at 72% solids, separation made at 325 mesh.

5. WATER RECLAMATION — Type A Thickener handles 120 tpd of reclaimed mill water.

DorrClone — T.M. Reg. U. S. Pat. Off.

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INCORPORATED
WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT
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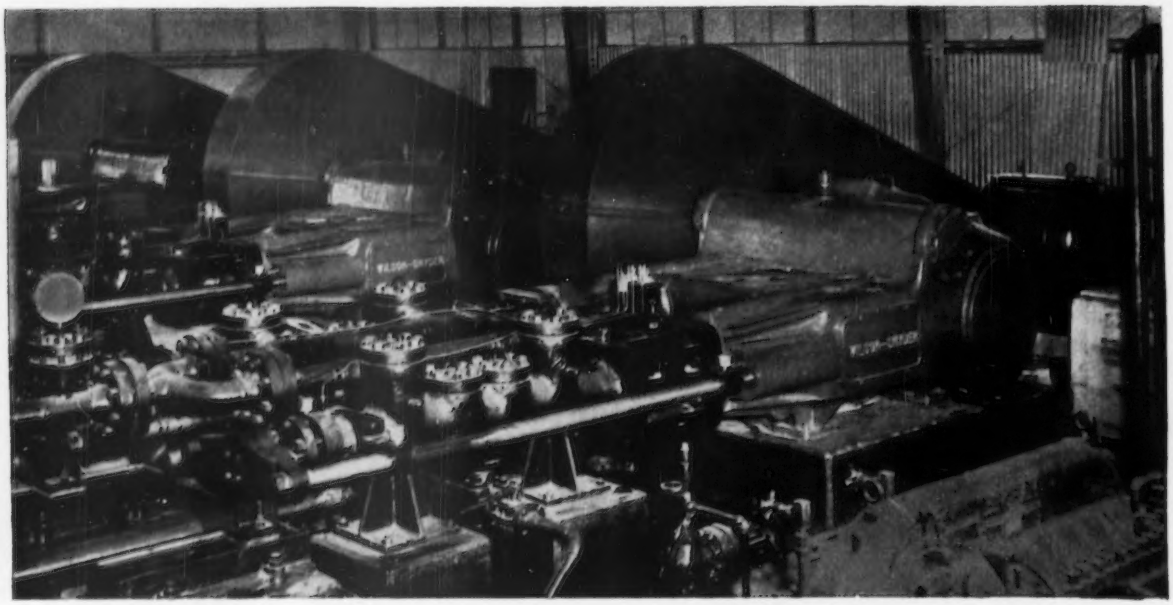


Let Wilson-Snyder Engineers help you plan for SLURRY PUMPING

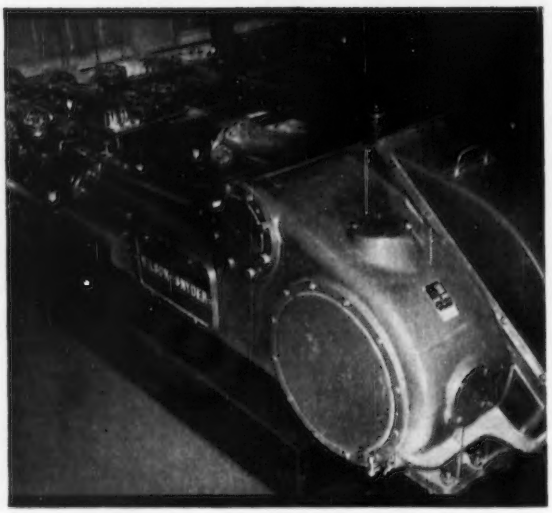
ALTHOUGH the pumping of slurries continues to present specific problems for every project, Wilson-Snyder has, for many years, been building pumps which excel in that kind of service.

Most noteworthy among our recent experiences in transportation of solids through pipelines, in slurry form, are these two well-known installations. We furnished the pumps for American Gilsonite Company's line from Bonanza, Utah to Gilsonite (near Grand Junction, Colorado), and also for Pittsburgh Consolidation Coal Company's line from Cadiz, Ohio to Cleveland, Ohio.

Fortified with much practical experience, Wilson-Snyder pump engineers know the basic problems in applications of this type and are more than willing to discuss them with you. We can give you valuable assistance in the application of slurry pumping equipment and show you the outstanding features of Wilson-Snyder pumps that are available for a wide range of displacements, working pressures, and fluid-end designs and materials.

Of course you'll want specialized engineering assistance for installing any slurry pumping project, but during the planning stages it just makes good sense to take advantage of our experience and testing facilities. Just write to:

WILSON-SNYDER WORKS—Braddock, Pa.
Oil Well Supply Division
United States Steel Corporation



AMERICAN GILSONITE COMPANY'S pumping station at the Bonanza, Utah mines relies upon three (two operating, one stand-by) Wilson-Snyder heavy-duty plunger pumps to move 630 tons of Gilsonite per day through the 72-mile pipeline for processing near Grand Junction, Colorado. Each pump is powered by a 300-hp motor and the system is capable of handling 325 gpm of slurry at 2200 psi.

WILSON-SNYDER PUMPS USS

UNITED STATES STEEL

Mechanization returns greater dividends with Edison R-4 Cap Lamps on the job

Edison R-4 Electric Cap Lamps can help modern mining machines realize their *full* potential.

Reason why? Because more and better light is always on the job with the brilliant, unfailing beam of the Edison R-4. This dependable source of illumination permits the miner to perform his duties with utmost efficiency and safety. You don't have long to wait for results with the Edison R-4, either. They register quickly in terms of accident prevention and increased tonnage per man-shift.

Let us demonstrate the advantages of this *quality* cap lamp in your underground operation. Write or call us soon for more detailed information.

MSA
SAFETY EQUIPMENT HEADQUARTERS

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
At Your Service: 76 Branch Offices in the United States

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Representatives in Principal Cities in Mexico, Central and South America
Cable Address: "MINSAF" Pittsburgh

Allis-Chalmers announces... **Newly**

1

Gang-operated disconnect switch isolates starter from incoming power — assures safe entry of high voltage compartments.

2

Steel cubicle is compartmentalized — separates high and low voltage equipment.

3

Short-circuit protection is provided by fast-acting current-limiting fuses, rated 150,000 kva at 2300 volts and 250,000 kva at 4160 or 4600 volts.

4

Overload protection is handled by accurate relays which trip only on excessive motor current, preventing needless motor stoppages.

5

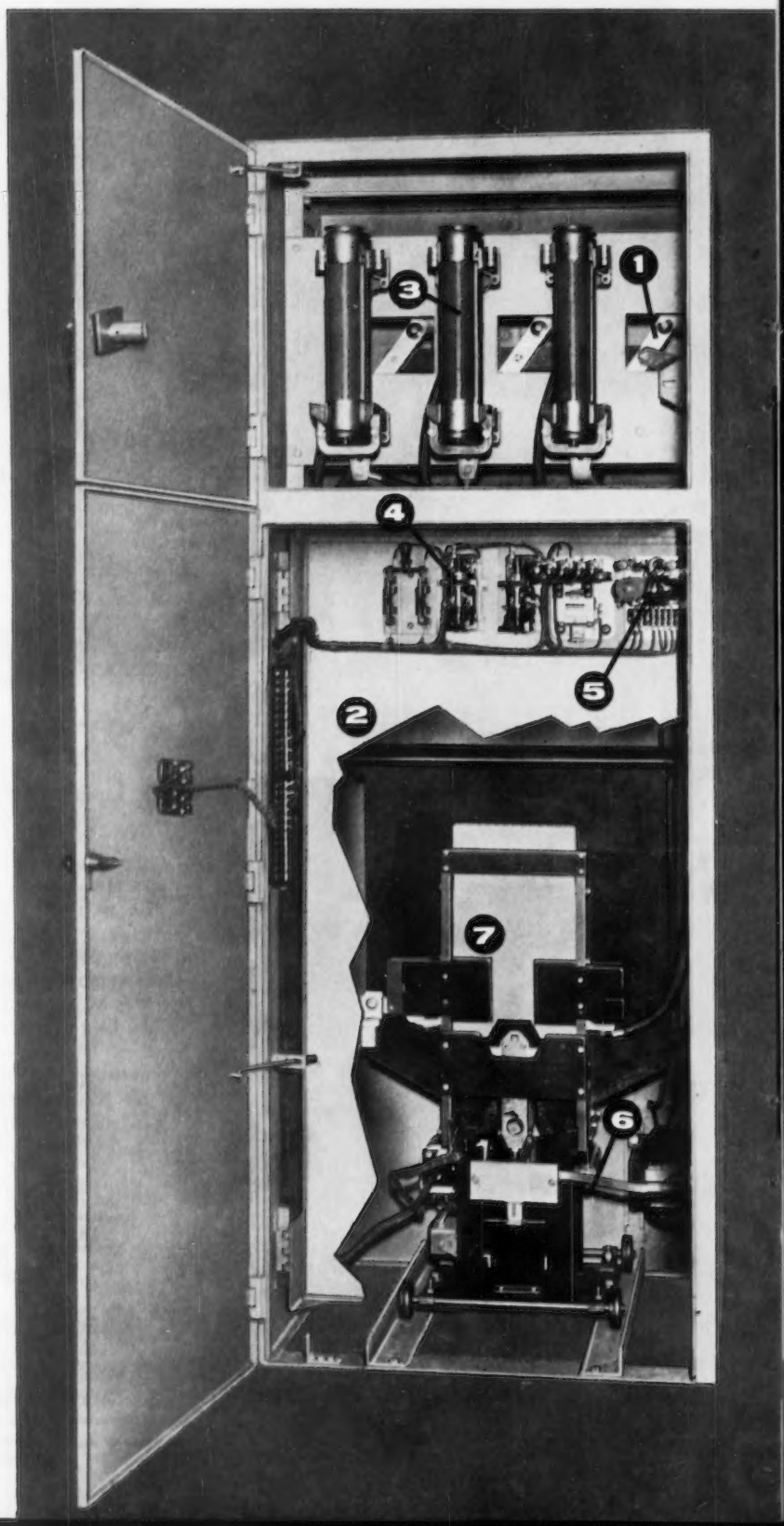
Undervoltage protection instantaneously opens line contactor on loss of voltage. Time-delay undervoltage protection also available.

6

Mechanical interlock coordinates contactor, disconnect switch, upper door and inner control barrier for maximum safety.

7

Roll-out contactor makes maintenance easy—even in narrowest aisle space. (Routine inspection and maintenance can be done with contactor in place.)



Designed

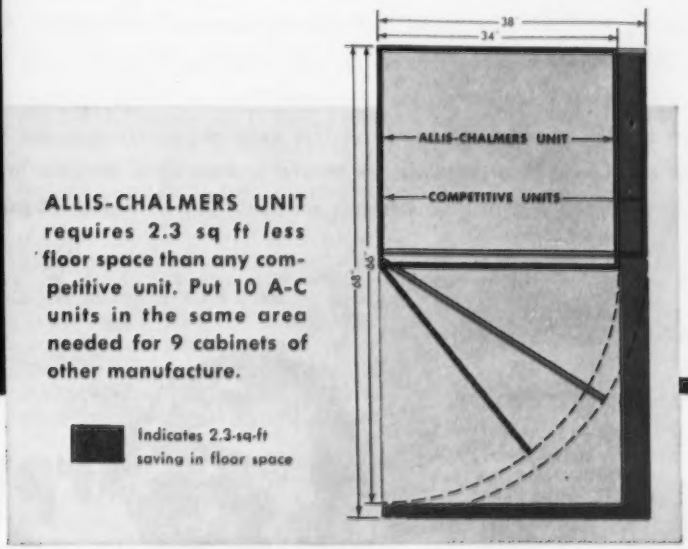
Type H High Voltage Motor Control

Combines front access with space economy...

In addition, you get maximum protection for personnel and machines, thoroughly tested components, and ample panel space for modifications. It's all built into the *smaller cabinet* of a newly designed line of Type H high voltage starters from Allis-Chalmers.

Here is control that couples compactness with roominess (for ease of maintenance) . . . here is a starter that joins test-proven performance with versatility (for addition of meters and relays) — AND the line meets every 2300 to 5000-volt motor need.

For more information on this engineering advance, contact your A-C representative or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



ALLIS-CHALMERS UNIT requires 2.3 sq ft less floor space than any competitive unit. Put 10 A-C units in the same area needed for 9 cabinets of other manufacture.

Indicates 2.3-sq-ft saving in floor space

ALLIS-CHALMERS

A-5517

ON THE go

by J. Hall Carpenter

ELECTRICAL CONCENTRATION OF IRON ORES is the subject of a paper to be presented by W. P. Dyrenforth at the AIME Fall Meeting in Tampa, Florida. This paper describes the process, developed by Carpco, of concentrating non-magnetic or weakly magnetic iron ores and is more particularly concerned with the concentration of low grade iron ores by virtue of the conductivity characteristics of the minerals contained. Siliceous hematites and martites have been extensively tested by the high tension method and have shown, in most cases, excellent results. Samples from certain specular hematite ore bodies have been concentrated from about 25 to 30% Fe up to 67 to 69% Fe with iron recoveries better than 90%. The possible future of high tension separation in the iron ore industry, particularly with respect to sub-arctic deposits, is outlined. The economics of the process, as applied to iron concentration, is also presented. Prints of this paper are available on request.

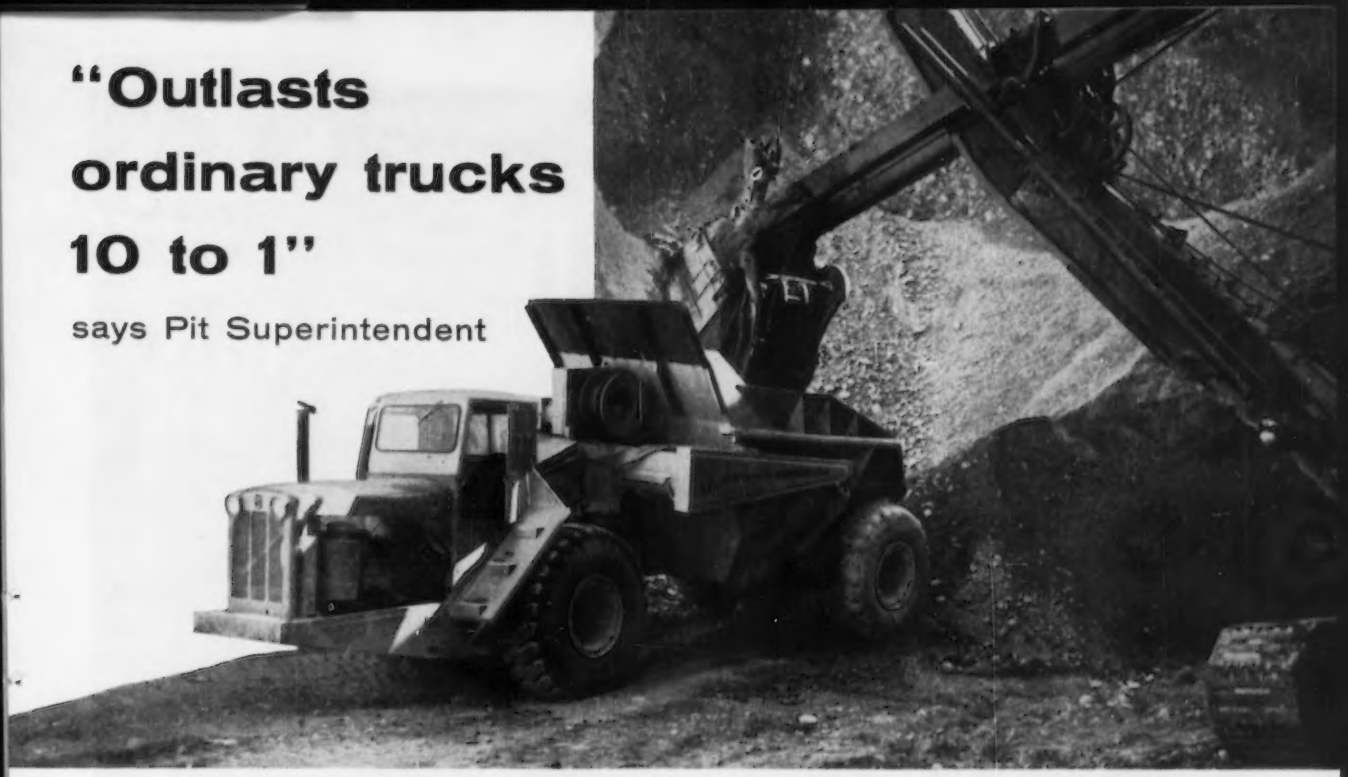
A DEWATERING VACUUM FILTER which dewaters granular minerals and simultaneously acts as a table feeder is now being produced in Florida by Carpco. Developed in Australia by Zircon Rutile, Ltd., these filters have been very successful over a number of years of use in several plants. The ingenious application of a barometric leg eliminates the need for a rotating suction joint. Driving gears and main bearing are above the sand so that wear and maintenance are negligible. They show a tremendous cost saving in drying since the mineral is dried at a constant low moisture content which cuts down dryer size and fuel requirements and raises overall drying efficiency. Bulletin CFB-101 describes the filters.

Carpco

CARPCO RESEARCH AND ENGINEERING • CARPCO MANUFACTURING, INC.
CARPCO CONSTRUCTION CORPORATION • CARPCO EXPORT CORPORATION
JACKSONVILLE, FLORIDA, U. S. A.

"Outlasts ordinary trucks 10 to 1"

says Pit Superintendent



Shovel operator quickly loads C Tournapull Rear-Dump with 19 tons of bank gravel. Low rear entry of bowl permits easy swing-out of empty dipper — even without closing door.

L-W hauler dumps load of gravel and rock into grizzly. With electric hoist, bowl can be lifted for full, instant dump, or controlled at a reduced angle for slow, precision feeding.

After 29 years of continuous digging in the same pit area, pit still produces 3600 tons of "pay dirt" per 12-hr. day. The last nine years, pit has been operated by Valley Sand and Gravel Co., Waukesha County, Wis. Valley's hillside excavation runs about 80′ deep. Company officials estimate it will be excavated at least another 30′ before digging operation is relocated to a new pit area.

Two LeTourneau-Westinghouse Rear-Dumps — one 22-ton model "C", and one 11-ton "D" — are setting a fast production pace by handling all hauls from pit to grizzly. Company uses another L-W Rear-Dump for hauling processed materials to stockpiles.

Haul heaping loads up 10% grade

In typical performance, C Tournapull® Rear-Dumps are loaded with 5 passes of 2½-yd. shovel — getting about 12½ bank yds. (19 tons). Three passes load the "D" with 7½ yds. (12 tons). Rear-Dumps haul 1100′ from pit floor . . . up a 10% grade . . . to grizzly. Except for delays at grizzly, each machine makes 9-10 trips per hour. Combined production of the 2 units averages 200 yds. (300 tons) per hour . . . 3600 tons per day.

"A good machine . . . gives no trouble," says operator

Until 1952, Valley Sand and Gravel Co. used ordinary trucks for their rough pit haul work. Each year they experienced heavy maintenance expenditures, amounting to thousands of dollars. In 1952 . . . in an effort to step-up pit production and cut maintenance expense . . . they purchased 2 L-W Rear-Dumps. These rugged off-road haulers proved so successful, they now operate 3 of them.

Superintendent Carl Darrow says, "Tournapull Rear-Dumps outlast ordinary haul trucks 10 to 1. Most truck bodies are too thin. Our work is also too hard on truck tires, transmissions, differentials, axles, springs and drive shafts."

Jim Schmeichen, operator of C Rear-Dump, comments, "It's a good machine . . . does the work, and gives us no trouble. You don't have to worry about breaking a spring."

Get facts for your type work

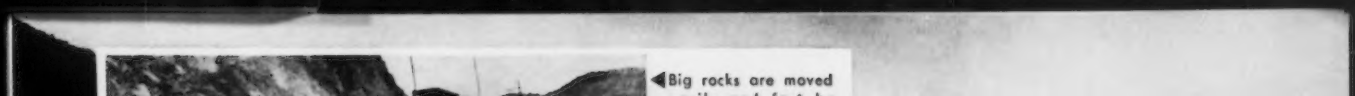
Check all the facts and figures available from other Tournapull hauler owners, for work like yours. See how these Rear-Dumps can give you more production at far less cost. L-W Tournapull Rear-Dumps are available in three sizes: 11, 22, 35 tons.

DRCR-1338-Q-b

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit



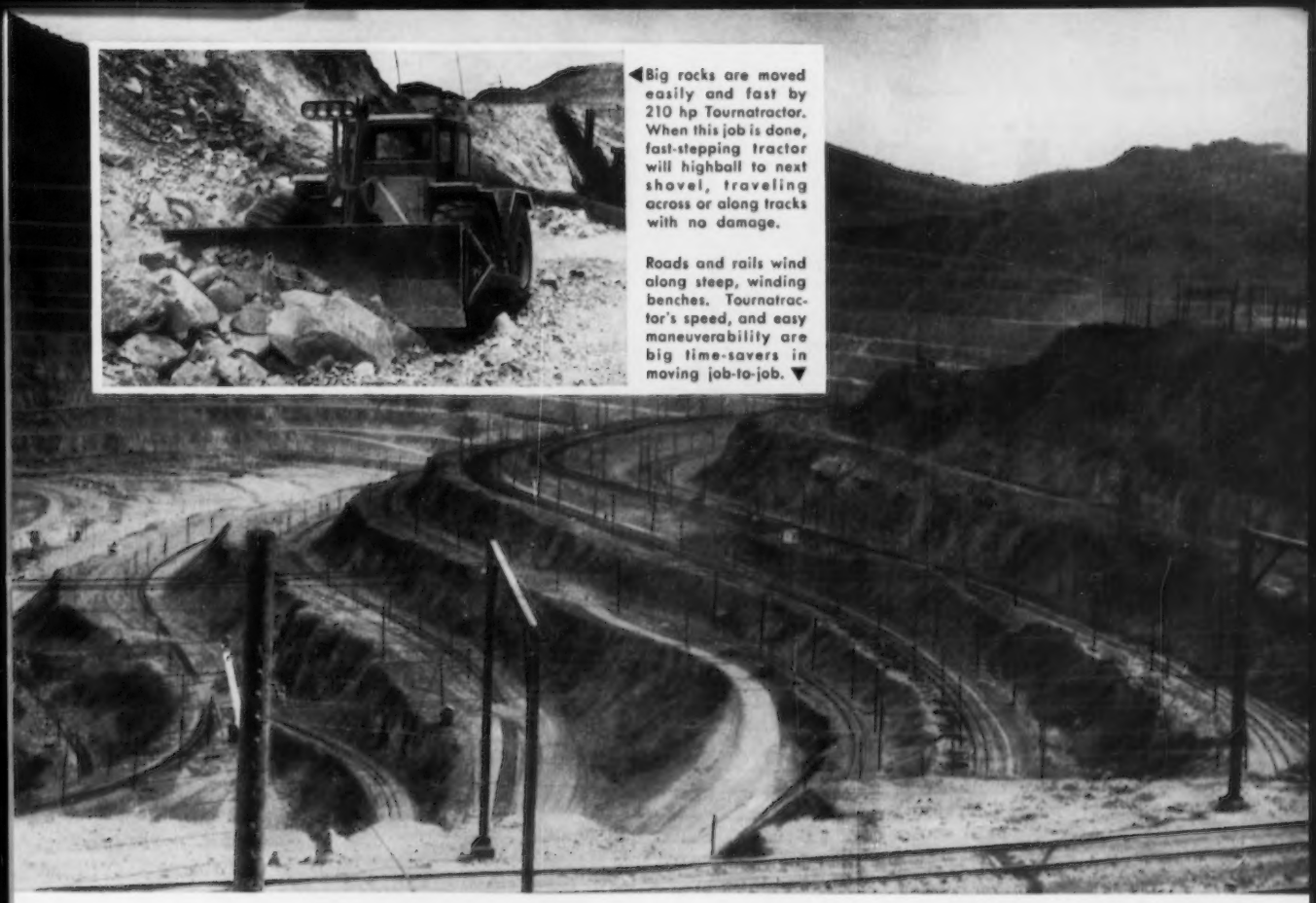
◀Big rocks are moved

Simplex Wire & Cable Company's new 1,400,000 volt impulse generator — the first of its kind to be installed in North America — represents just one aspect of research at Simplex. Simplex scientists and engineers originated the process of vulcanizing portable rubber cords and cables in a lead mold. Simplex developed the first heavy-duty portable electrical cable — Simplex TIREX. The first truly moisture-resistant rubber insulation was the outcome of a commercially acceptable method of deproteinization developed by Simplex. Simplex designed the first interlocked armored cable for underground service — Simplex CONDEX. And now — Simplex C-L-X — the portable, corrugated metallic duct WITH SEALED-IN CABLE. **SIMPLEX WIRE & CABLE CO.**, Cambridge, Massachusetts and Newington, New Hampshire.

Simplex

LIVE BETTER ELECTRICALLY

Highest quality cables for: Mining • Power & Lighting • Construction • Transportation • Communications • Signalling



◀Big rocks are moved easily and fast by 210 hp Tournatractor. When this job is done, fast-stepping tractor will highball to next shovel, traveling across or along tracks with no damage.

Roads and rails wind along steep, winding benches. Tournatractor's speed, and easy maneuverability are big time-savers in moving job-to-job. ▼

rubber-tired tractors end rail, crawler damage ...speed pit clean-up

At a major southwestern copper mine, four speedy 210 hp LeTourneau-Westinghouse Tournatractors® have solved a serious rail and crawler damage problem — and are paying their owners other substantial performance dividends.

The problem: ore blasting often buries sections of the more than 50 miles of railroad track in the pit. When crawler-type tractors had the job of dozing away debris, they regularly damaged ties, rails, and their own crawler tracks. Today, rubber-tired Tournatractors handle this assignment with *no* damage. Their wide, low-pressure tires flex harmlessly while rolling over track installations... never throw rails out of alignment... never block switches, or chamfer ties.

Faster shovel-to-shovel travel

Superintendents at the mine report that, in addition to solving this problem, Tournatractors have demonstrated two other important work assets: faster job-to-job travel speed, and unusual ability to work economically in rocky material.

Speed on travel between assignments is particularly important on this operation, because major task of Tournatractors is cleaning up around shovels spotted all along maze of over 150 miles of roads built on steep, winding benches. Tournatractor, with 2 to 3 times the speed of crawlers, produces major savings in work and travel time... gets more work done per day.

Less maintenance cost... less downtime

Tractor repair bills have also been cut, because tire-cushioned Tournatractors work over rocky surfaces without abrasion and shock damage. Crawlers, on the other hand, were a continual problem because of breakage and wear from rocks and grit in their track assemblies. Tournatractor's anti-friction drive is sealed, enclosed in rugged steel housings. Rocks and grit are sealed out, can't clog gears and rollers.

Maintenance of rubber-tired tractors has been easy, fast, economical. Operators report, for instance, that lube time is only one-third that needed for crawlers. These big LeTourneau-Westinghouse units are working long hours, too... one unit works 3 shifts a day, 7 days a week. Two others work 2 shifts a day. Downtime has been low. Strong, simple construction keeps Tournatractors working longer hours without breakdown.

Look into the money-making advantages of rugged, high-speed, rubber-tired LeTourneau-Westinghouse equipment in *your* operation. We'll furnish full details and arrange a working demonstration.

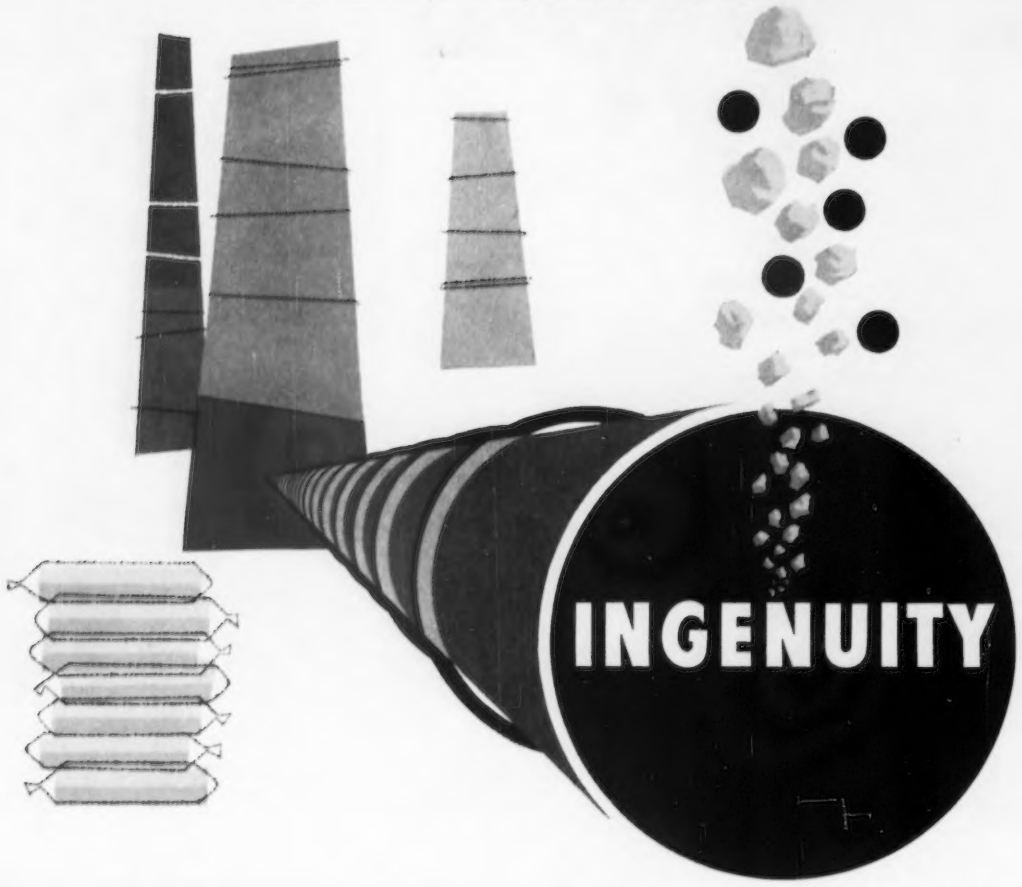
CT-1484-MQ-1

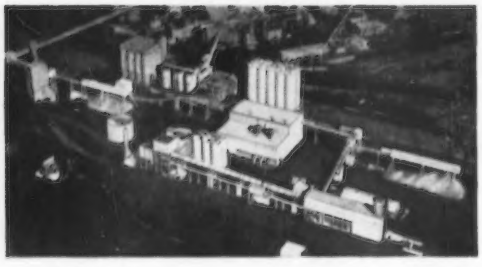
LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

call KE for plant expansion or new facilities





1,250,000 barrel cement plant addition recently completed by KE for Marquette Cement, one of world's largest cement producers.

has made KE a major engineer-contractor serving the Minerals Industry

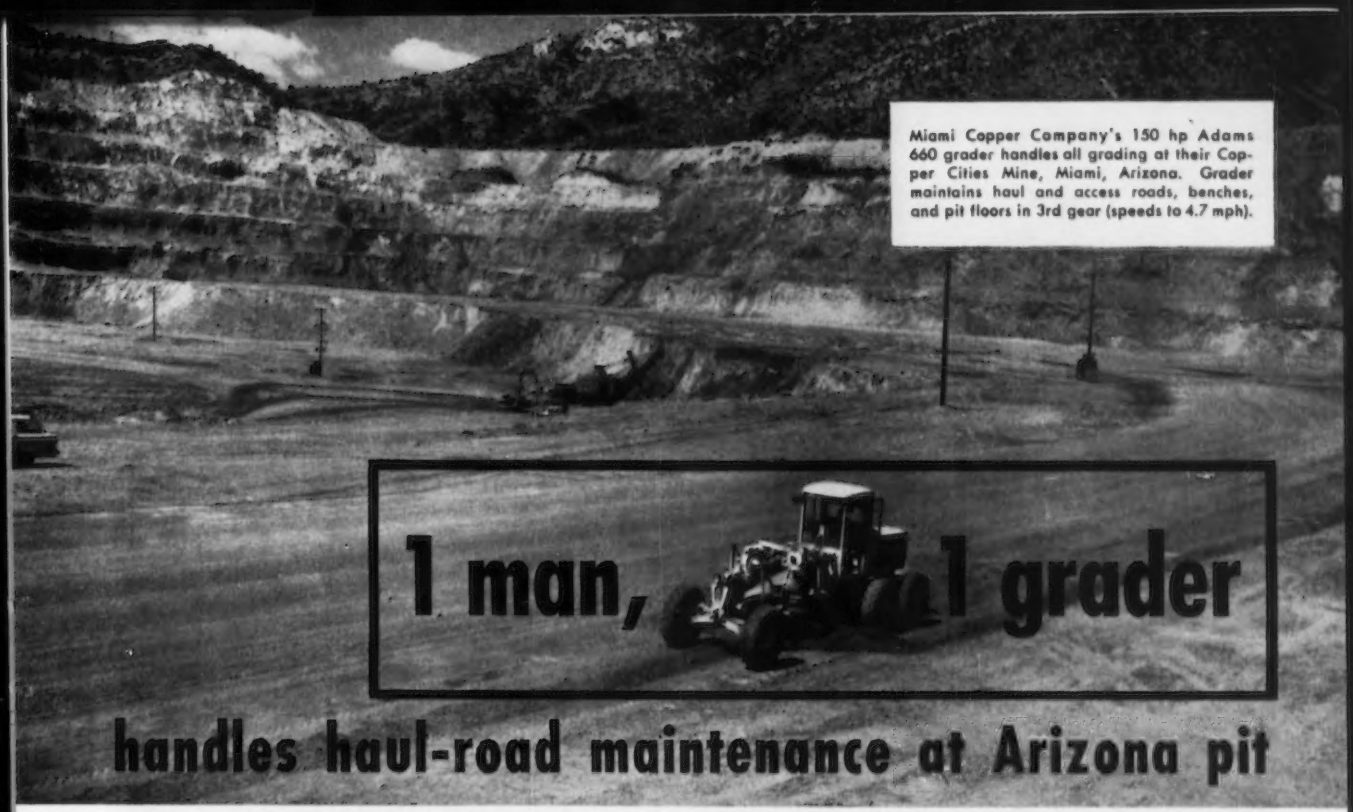
Placing of four fully-lined mills in a few hours instead of days—a unique center pier kiln drive —a 2,700′ cement transport "airway." With these and many more planned innovations and short-cuts, Kaiser Engineers completed Marquette Cement's Cape Girardeau plant expansion quickly and economically. Construction cost and time were well below industry average.

Mining, transportation, beneficiation, materials handling, processing in cement, gypsum, coal, ferrous and non-ferrous metals facilities—these are but a few of the fields wherein KE serves the Minerals Industries—from economic analysis through start-up.

KE ingenuity—multi-industry experience, keenly applied—can benefit your next facility. Let us show you how.

KAISER ENGINEERS engineers-contractors
Contracting since 1914

Kaiser Engineers Division of Henry J. Kaiser Company • Oakland 12, California • New York, Pittsburgh, Washington, D.C., Buenos Aires, Calcutta, Dusseldorf, Montreal, Sydney, Tokyo 4367



Miami Copper Company's 150 hp Adams 660 grader handles all grading at their Copper Cities Mine, Miami, Arizona. Grader maintains haul and access roads, benches, and pit floors in 3rd gear (speeds to 4.7 mph).

1 man, 1 grader handles haul-road maintenance at Arizona pit

Miami Copper Company mines 24,000 tons of rock and ore per day at its Copper Cities Division pit, Miami, Arizona. To transport this material, nineteen 30 to 40-ton trucks are used. An average of 8 trucks per shift pound 3 miles of haul and access roads 24 hours a day, 7 days a week. To keep these roads and 6 miles of outside roads, plus benches, and pit floors in high-speed-hauling condition, the mine relies on only 1 grader, working only 1 eight-hour shift 6 days per week. It is a 150 hp Adams* 660.

Maintains roads in 3rd gear

With Adams' standard 8 forward and 4 reverse speed transmission (3 optional "creeper gears" also available), grader operator always has "just-right" power-speed ratio to handle any job fast and accurately. On haul-road maintenance, Adams 660 works at speeds to 4.7 mph, in 3rd gear. Grader levels ridges, fills ruts, and improves drainage. Adams' 26 mph travel-speed pays off, too! Unit is never more than a few minutes away from any assignment around the pit area.

"Handles jobs twice as fast"

Said operator T. S. Ashford, "I like the power of the '660'. I can do a job twice as fast." Ashford also added, "I like the controls. I can work two controls (lateral shift and circle) at same time, with one hand, on turn-around . . . can get going fast!"

Smooth, accurate control from cab

On the Adams 660 (as on all Adams models), all blade-positions are *power-controlled* from the cab. Operator has *exact* control, because Adams' blade mechanism is always firm on its sturdy, one-piece, wishbone frame. What's more, blade always operates at constant speed — regardless of the number of controls in use.

Blade positioning is fast . . . goes from deep ditch-cut to high bank-cut in less than a minute . . . to other positions even faster. Moldboard turns 360° for quick changes from forward work, to reverse ditching and grading.

See Adams in action

Why not let us arrange for an Adams grader demonstration? See how a LeTourneau-Westinghouse grader can help *you* cut costs and increase production. 6 sizes — 60 to 190 hp. Choice of GM or Cummins engines on 5 larger models. 190 hp grader has torque-converter drive. Write for details.

*Trademark G-1524-MQJ-1

Speedy 660 Adams grader cleans up around shovels —saves wear on haulers' tires and permits faster shovel operation. At the Copper Cities pit, 24,000 tons of rock and ore are mined per day.

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

World's Largest Shovel is the Mountaineer, built by Marion Power Shovel Co. for Hanna Coal Co. It is 16 stories high, and scoops up overburden in 90-ton bites. USS "T-1" steel is specified for such major components as the bucket, dipper stick and crowd rack; to assure the strength, toughness and ruggedness that adds up to long service life.

"T-1"...a super-tough nickel alloyed steel prevents breakage...slashes downtime

At 38°F below zero...or at 900°F above..."T-1" steel stays *super-tough!*

Downtime troubles *go out* when "T-1" steel *goes in* dipper sticks, shovel buckets, car bottoms, bulldozers and other mining equipment.

That happens because "T-1" steel is a constructional alloy steel combining exceptionally high levels of strength and toughness. It stands up under heavy shock loads. Curbs breakage the year 'round.

Note its advantages:

90,000 psi minimum yield strength.

Readily weldable . . . needs no preheat nor stress relief.

Resists impact at sub-zero temperatures.

Four times as resistant as carbon steel to atmospheric corrosion.

Use "T-1" steel for heavily stressed parts. Watch them stay on the job, earning profits. Why take chances with steel of lower yield strength and consequent risk of failure in service? Idle men and machines make it a costly proposition...so, put "T-1" steel to work now.

For details on USS "T-1" steel, write to United States Steel Corp., Pittsburgh 30, Pa.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

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ACCO for Better Values

American Cable TRU-LAY VHS® WIRE ROPE

15% STRONGER

DRAGLINE OPERATOR SAYS,

"Tru-Lay VHS is in a Class by Itself"

John Yamulla, dragline operator of Yamulla Excavating Company, Gowen, Pennsylvania, says, "TRU-LAY VHS is in a class by itself because it lasts and lasts. I never saw any other grade of wire rope give so much service through the beating we hand it! Before we started using TRU-LAY VHS, 600 hours of service was about all we could expect from a line. Since taking on TRU-LAY we average 1000 hours—a savings in rope replacement and equipment down time that adds into really big money."

Makes the Toughest Jobs Seem Easy

TRU-LAY VHS is actually the first entirely new grade of wire rope to be introduced in years. Before VHS (Very High Strength) came along, Improved Plow Steel was the highest grade of wire rope you could buy. For certain types of earth-moving jobs, TRU-LAY Preformed Improved Plow Steel still is the best line to use. But, where extra strength and toughness are called for—as in the case of draglines, shovel hoist ropes, scraper and dozer cable—you'll be dollars ahead using TRU-LAY VHS.

Here's the Secret of VHS

The answer lies in a new grade of rope wire developed by ACCO's own process. Made from premium steel billets carefully selected for the very finest chemical and physical properties, this new rope wire is processed into a line that's tougher, more wear resistant, and 15% stronger than Improved Plow Steel.

Only One Source for VHS

Remember . . . there's only one superior grade of wire rope on the market today—VHS; and only one company makes it—American Cable! Tell your distributor you want VHS the next time you order.

ACCO

American Cable Division

AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn.

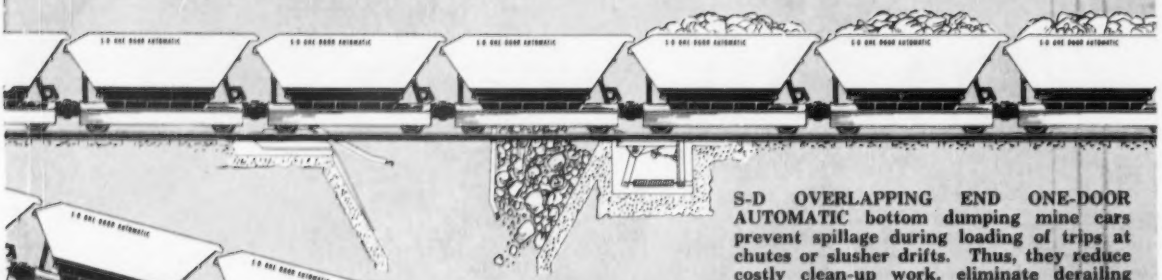
Why in the world didn't we think of this before?

By combining our overlapping end design for bottom dumping mine cars and our one-door bottom dumping car design, our engineers have developed the S-D OVERLAPPING END ONE-DOOR AUTOMATIC, for years needed in the metal field because it offers:

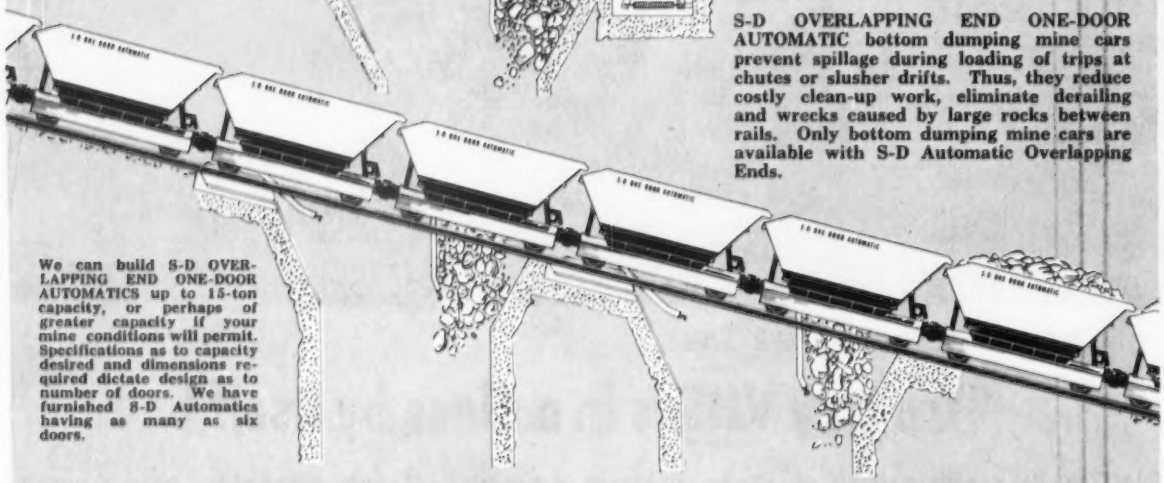
- GREATER CAPACITY FOR SAME OVER-ALL DIMENSIONS
- BETTER TRACKABILITY
- LOW CENTER OF GRAVITY

- WIDE DOOR OPENING
- CLEAN SHEDDING
- SIMPLE and LOW COST DUMP FACILITY
- RUGGEDNESS OF DESIGN

S-D AUTOMATICS with OVERLAPPING ENDS PREVENT SPILLAGE!



S-D OVERLAPPING END ONE-DOOR AUTOMATIC bottom dumping mine cars prevent spillage during loading of trips at chutes or slusher drifts. Thus, they reduce costly clean-up work, eliminate derailing and wrecks caused by large rocks between rails. Only bottom dumping mine cars are available with S-D Automatic Overlapping Ends.



We can build S-D OVERLAPPING END ONE-DOOR AUTOMATICS up to 15-ton capacity, or perhaps of greater capacity if your mine conditions will permit. Specifications as to capacity desired and dimensions required dictate design as to number of doors. We have furnished S-D Automatics having as many as six doors.

DUMP FAST, THOROUGHLY into any type underground bin you have!

S-D AUTOMATICS offer this further low cost haulage advantage: Provisions can be made so one man, the locomotive operator, can move the train by loading point by means of remote controls and at the same time operate chute loading mechanism. This same operator dumps the trip, offering you ONE-MAN HAULAGE! — *Another MAJOR mine car development from Sanford-Day resulting from our engineers continually working out new car designs and methods to reduce haulage cost to the mine industry.* Write or call us today. *Sanford-Day Iron Works, Inc., Knoxville, Tenn. U.S.A.*

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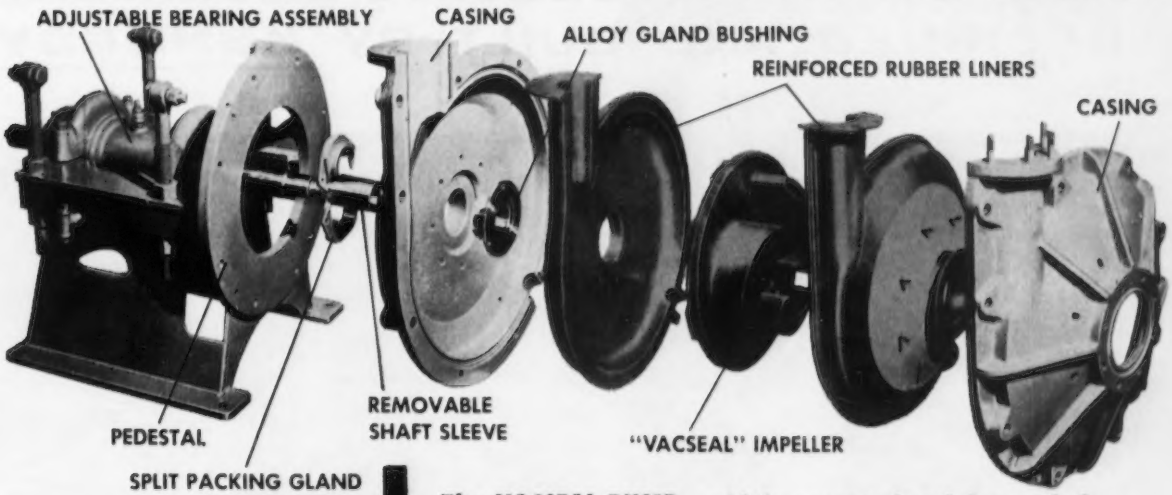
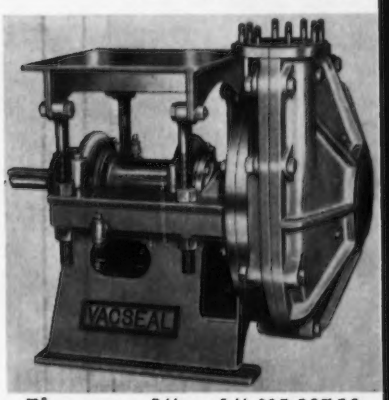
"SUPER MARKET FOR MINE CARS" — all types ★ PRECISION WHEELS ★ "BROWNIE" HOISTS, CAR RETARDERS, SPOTTERS, PUMPS AND OIL SPRAY SYSTEMS ★ GISMO SELF-LOADING TRANSPORT that loads (mucks) in development or production . . . transports . . . supports 2 to 5 jib mounted drills . . . back fills . . . moves boulder rocks . . . makes its own roadways and cleans up completely — a new method of hard rock mining offering a tremendous reduction in cost per ton!

VACSEAL PUMP

with REPLACEABLE LINER





The new 4″ x 6″ VACSEAL PUMP now available with Replaceable Liner

Performance:

Heads.....to 120 ft.
Capacities.....to 700 GPM
Slurries.....to 70% solids

The VACSEAL PUMP—widely accepted and demanded as the reliable centrifugal pump for tough conditions involving corrosives and abrasives — is available with **REPLACEABLE RUBBER LINERS.** These liners are steel-reinforced against collapse and flutter and are easily replaceable at lower cost than the permanent type. VACSEAL PUMPS are available in natural rubber, Neoprene, hard iron, or all alloy with shaft protection of stainless steel, bronze, special alloy, porcelain or Teflon plastic.

The unique feature of the VACSEAL PUMP is the dry gland that does not require the use of sealing water.

Galigher engineers are at your service through correspondence or personal conference . . . submit your problems to men who know.

Leaders in Experience and Service

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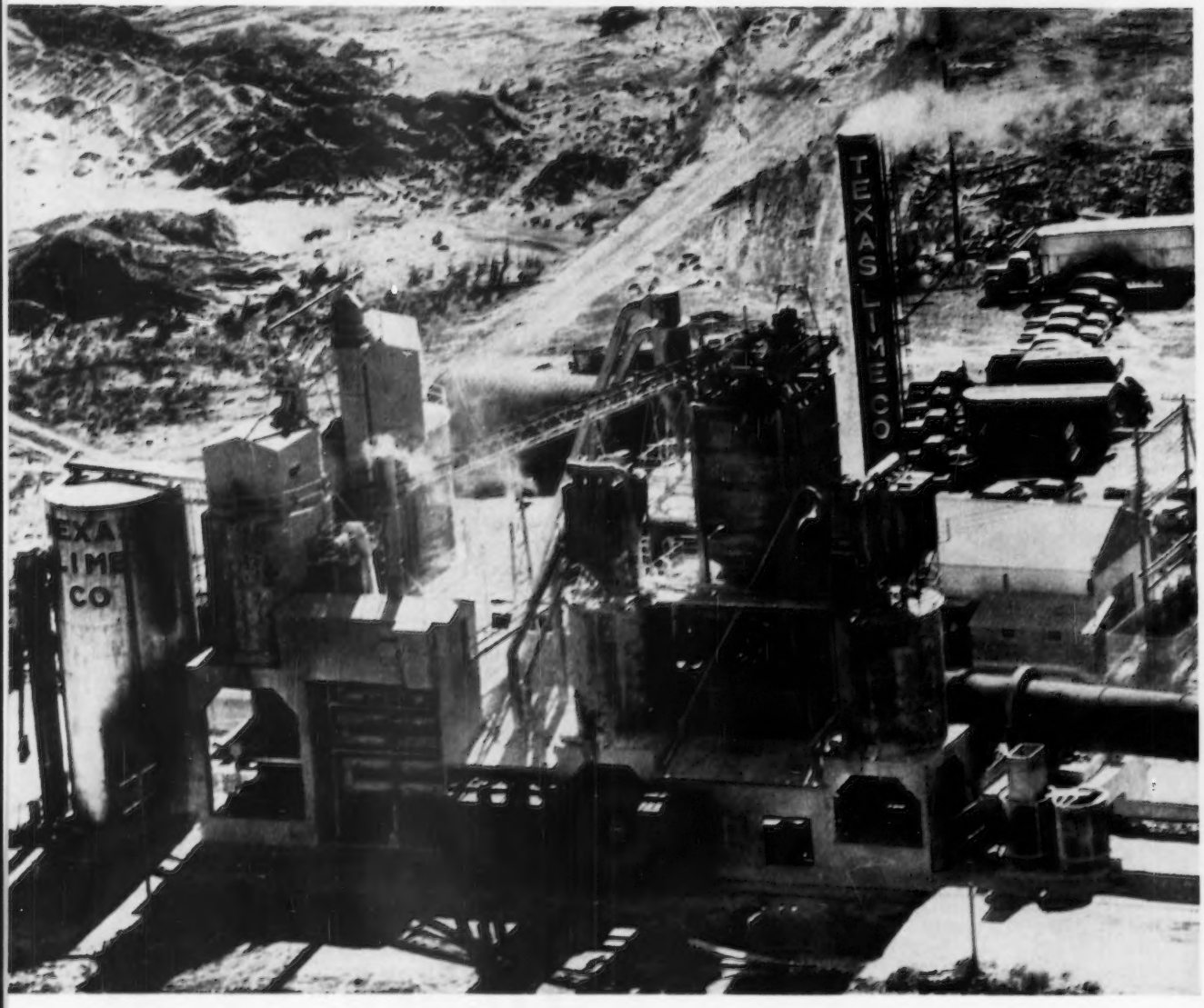
ALL MAJOR PROCESSING EQUIPMENT DESIGNED AND BUILT BY **KENNEDY**



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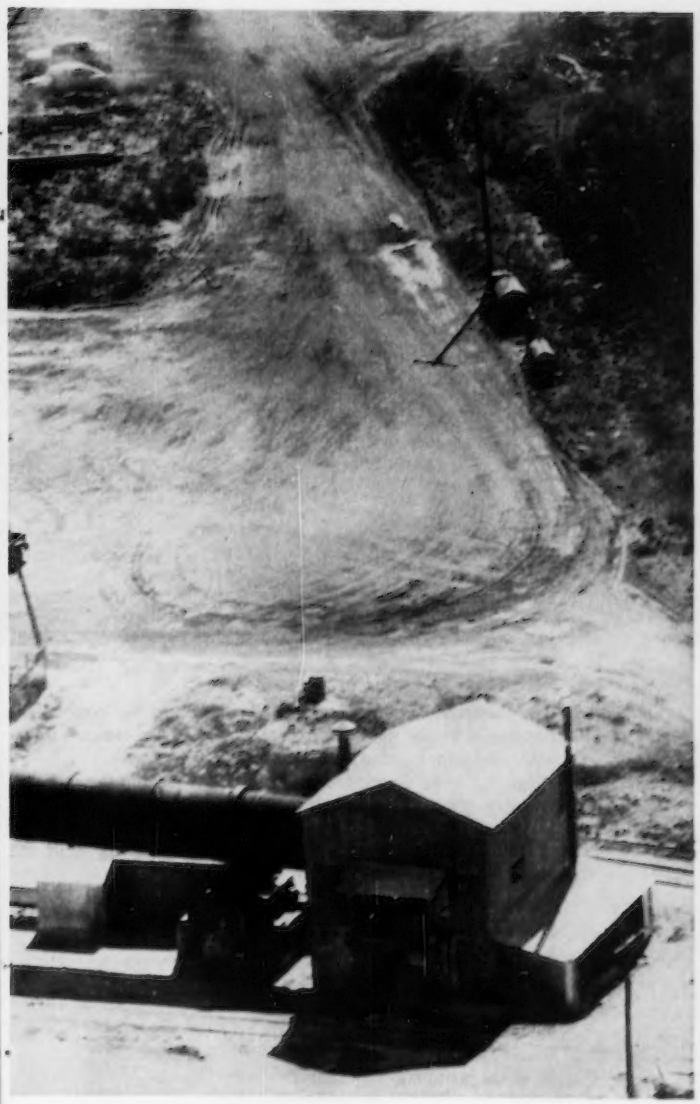
...at Texas Lime Company

Cleburne, Texas



TEXAS LIME COMPANY—150 Ton Per Day Lime Plant. 9' x 130' KENNEDY Rotary Kiln with Preheater and Deheater.

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CHECK √ *these Features for*

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- √ *Kennedy Stone Preheater*
- √ *Kennedy Short—2 tire rotary kiln*
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Similar installations throughout the world are noteworthy for their DEPENDABILITY and PROFITABLE OPERATION.

Consult us for a complete lime plant or any part thereof.

THE MOST PRODUCTIVE ACRES

For roughing, scavenging and cleaning

Wemco Fagergren Flotation Machines

deliver the most per foot

and per dollar.

Where flotation machines are used by the acre, the Wemco Fagergren is by far the most frequent choice. The reasons are equally important to the user of many cells or few. Because the large operators can afford and do run the most exhaustive competitive tests, they are able to determine which flotation machines provide the most profits at least cost.

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Wemco's field engineers can show you the proof.

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RECORDS* PROVE

Twice the rope life

**Case histories show the proof. Yellow Strand Flattened Strand Wire Rope is making records of double the life, and even more, compared to round strand construction wire ropes. Ask your distributor, or write us for actual records on its performance.*

...with YELLOW STRAND Flattened Strand Wire Rope

It has greater surface area! It has 10% greater strength! It's more crush resistant! It gives up to double, or more, the life of round strand rope! These are, briefly, the profitable advantages of Yellow Strand Flattened Strand on your dozers, scrapers, draglines, trench hoes and hoist lines.

And Yellow Strand Flattened Strand is "always on hand" at your nearby Broderick & Bascom distributor. You can depend on his specialized "know how" in recommending the right rope for your equipment. You can benefit by his prompt attention to your needs — backed by nationwide factory and warehouse stocks by B & B.

Specify Yellow Strand Flattened Strand on your next wire rope order and get the proof of lower overall costs and longer life. Ask your nearest B & B distributor, or write direct to us for more information on all your wire rope needs.

Yellow Strand

...always on hand

Here's Why Flattened Strand Lasts Longer

Compare Yellow Strand Flattened Strand with round strand wire rope (at right). In Flattened Strand you have twelve contact points, greater bearing area, smoother surface, less wear. Result: longer service, lower final cost.

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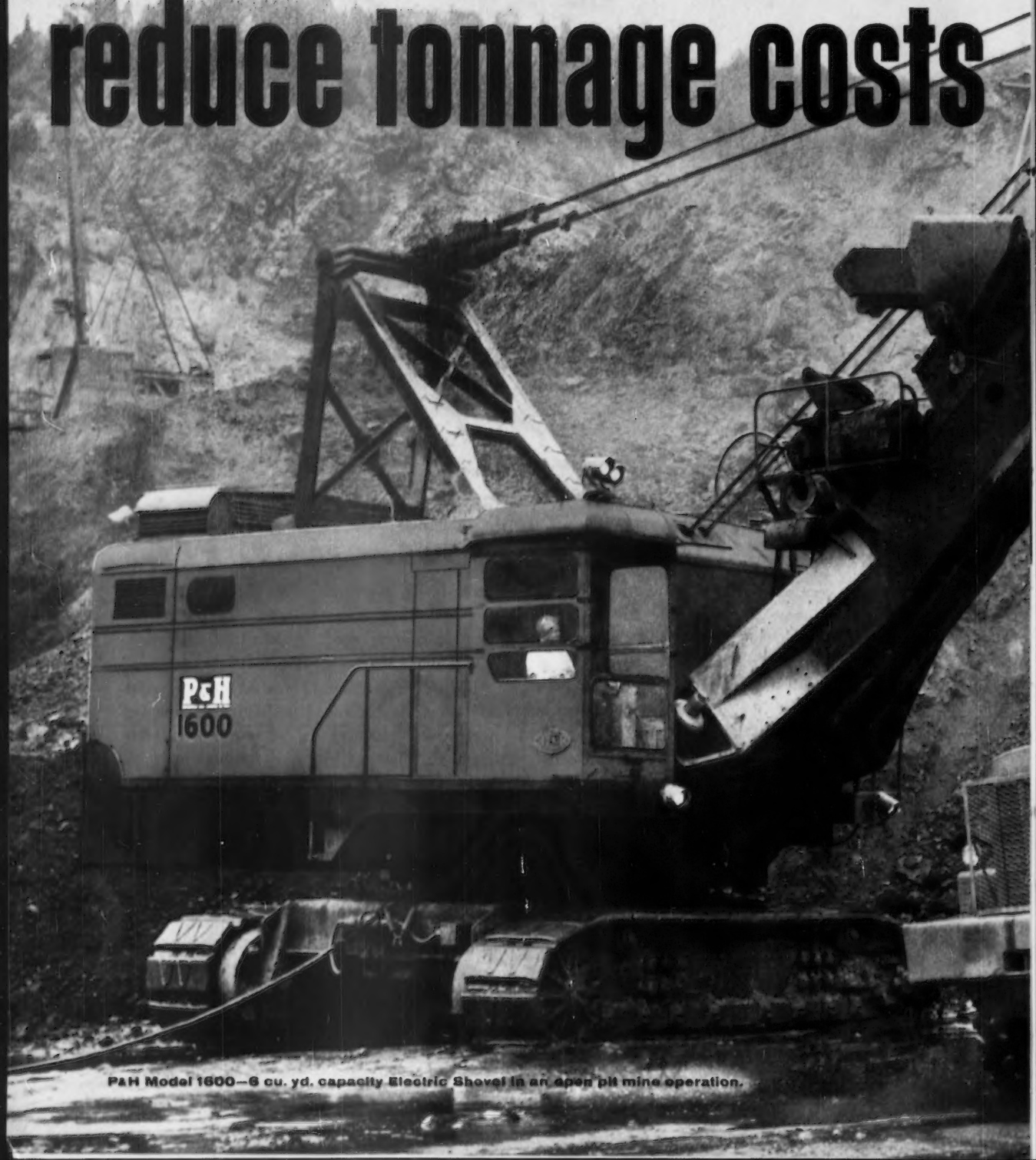
Factories and Branches throughout the U.S.A.

P&H Electrics with reduce tonnage costs



P&H Model 1600—6 cu. yd. capacity Electric Shovel in an open pit mine operation.

MAGNETORQUE®
in heavy digging

Exclusive P&H MAGNETORQUE® hoist drive puts more power into the bank when you need it, working smoothly, steadily and efficiently under progressively tougher digging.

MAGNETORQUE transmits power from the shovel hoist motor to the dipper magnetically for faster action and at the same time, eliminates shock and impact to the hoist gear train and motor. Response is immediate to varying load conditions.

ELECTRONIC CONTROLS, exclusively designed and built by P&H, provide fastest action of any type of control known. All shovel motions are smoother, resulting in consistently higher output.

With MAGNETORQUE, P&H ELECTRONIC CONTROLS and P&H scientific weight distribution you get higher line pull per cu. yd. of dipper capacity resulting in increased dipper fill factor . . . more production at lower cost.

P&H designs, manufactures and applies all electrical equipment specifically for electric shovel service.

P&H Electric Shovel Line:
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Milwaukee 46, Wisconsin

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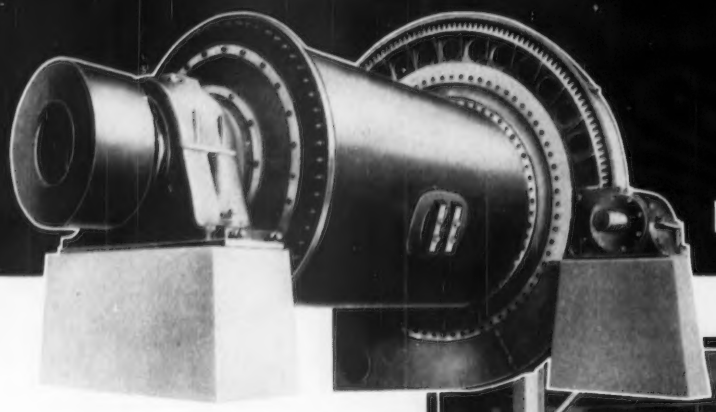
is engineering proved

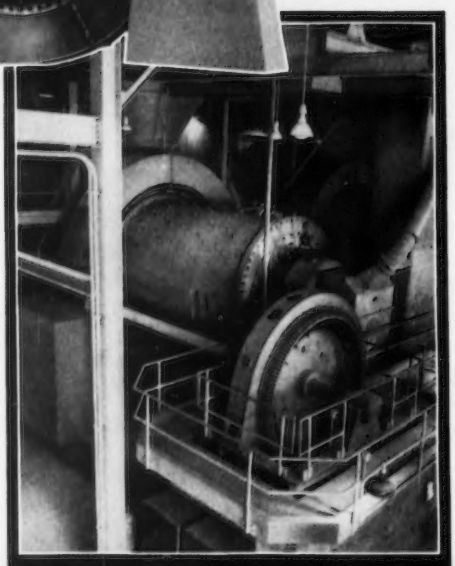


Traylor

BALL MILLS

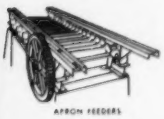
Traylor-Made Grinding Mills feature shell liners of manganese or high carbon steel in plain, wave, cascade or Lorain type. The shells are of all welded steel construction, main bearings are made of Meehanite metal. Driving gears are steel, precision cut on our Maag gear generator. Mills may be fitted with drum feeders, scoop feeders or a combination of the two.

Traylor Grinding Mills are offered in a variety of types including Ball, Rod, Compartment and Tube Mills. Write for Bulletin No. 11-121 today.

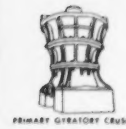


Traylor Ball Mills are made in two types—overflow and diaphragm discharge. They are built for either wet or dry grinding.

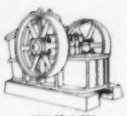
SECONDARY GYRATORY CRUSHERS



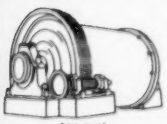
APRON FEEDERS



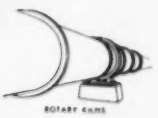
PRIMARY GYRATORY CRUSHERS



JAW CRUSHERS



BALL MILLS



ROTARY KILNS

Traylor

TRAYLOR ENGINEERING & MFG. CO. 1901 MILL ST., ALLENTOWN, PA.

Sales Offices: New York — Chicago — San Francisco

Canadian Mfr.: Canadian Vickers, Ltd., Montreal, P. Q.

AN IMPORTANT ANNOUNCEMENT

TO USERS OF EXPLOSIVES

American Cyanamid Explosives Now Serve You Nationwide and Market-Wide!

In a move to extend and broaden the range of our services to explosives users, American Cyanamid Company has purchased the plants, magazines and sales facilities of Illinois Powder Manufacturing Company.

Because of these expanded facilities, it is now possible for Cyanamid to serve you better...faster...with a wider range of dependable, *quality* explosives, electric blasting caps and blasting accessories.

Our sales representatives will welcome the opportunity to analyze and discuss your blasting problems.

CYANAMID

AMERICAN CYANAMID COMPANY
EXPLOSIVES DEPARTMENT
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SALES OFFICES:

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PRODUCTS:

High Explosives
Permissibles
Blasting Agents
Blasting Powder
Blasting Caps
Electric Blasting Caps
Seismograph Explosives
Blasting Accessories

ROAD CONSTRUCTION

QUARRYING

METAL MINING

COAL

OIL EXPLORATIONS

KOEHRING WORK CAPACITY *in action...*

21.5 mph Cruiser® — One man controls all operations, one engine supplies all power for work and travel on Koehring 205 Cruiser crane. There's a full range of low working speeds up to 7 mph — plus travel speeds up to 21.5 mph. It has smooth torque-converter drive, power steering, 27½-foot turn radius, 30% gradability. Usefulness is unlimited in mines, pits, and quarries. 205 Cruiser lifts up to 15 tons — handles ½ to ¾-yard clamshell or dragline buckets on a wide work radius — converts to ½-yard shovel or hoe.

Swings a big bucket — Notice the size of this dragline, stripping a coal seam in an Eastern mine (below). It's the big Koehring 1205 — and handles 3 to 4-yard bucket, depending on weight of materials. Boom lengths: 60 to 170 feet. This big-capacity stripper also converts to 3-yard shovel. High-lift model has a 3-yard dipper on 40-foot shovel boom — or a 2½-yard dipper on 50-foot shovel boom.

Ship to shore — A pair of Koehring 405 clamshell cranes, mounted on a Great Lakes dredge — one of the world's largest — solved the problem of transferring sand from the ship's hold to shore. With this system, approximately 4,500 tons of sand are unloaded in 6 hours. Crane in foreground dumps into a Johnson Lo-Bin, mounted on flanged wheels. Lo-Bin travels along track, transports sand to a swinging, boom-type conveyor, which stockpiles it at dockside. On clamshell work, Koehring 405 handles 1 to 1½-yd. buckets. Check its other capacities in chart on opposite page.

KOEHRING DIVISION OF KOEHRING COMPANY, Milwaukee 16, Wis.

Here are some figures that will interest you:

KOEHRING MODEL	SIZE DIPPER	LIFT CAPACITIES (Crawler ratings based on 75% of tipping load. Rubber-tired machines — 85% of tipping load.)	
205 CRAWLER	½-Yd.	20,000 lbs.	at 10-ft. radius
205 ON RUBBER	½-Yd.	30,000 lbs. 14,600 lbs.	at 12-ft. radius at 20-ft. radius
305 CRAWLER	¾-Yd.	30,000 lbs.	at 12-ft. radius
305 ON RUBBER	¾-Yd.	50,000 lbs. 15,800 lbs.	at 10-ft. radius at 30-ft. radius
405 CRAWLER	1-Yd.	40,000 lbs.	at 12-ft. radius
445 ON RUBBER	(Crane only)	90,000 lbs. 40,000 lbs.	at 15 ft. radius at 25-ft. radius
605 CRAWLER	1½-Yds.	72,300 lbs.	at 12-ft. radius
805 CRAWLER	2-Yds.	104,200 lbs.	at 12-ft. radius
1205 CRAWLER	3-Yds.	190,000 lbs.	at 12-ft. radius

Want more information? See Koehring distributor.

K760

In heavy rock — Owner of this Southern mine needed a heavy-duty shovel to strip rocky overburden — picked a Koehring ¾-yard 305 for the job. Its powerful digging crowd, and rugged strength of deep-section boom and dual dipper sticks, proved more than a match for the heavy rock. Yet, in work like this, 90% power-assist on main drum clutches gives operator a light lever-pull and sensitive "feel" of load. Power, strength, stability as a shovel increase the 305's work capacity with all attachments. For proof, check its lift ratings (at left).

free-machining

MAX-EL 3½ ALLOY STEEL

gives parts like these high strength, toughness

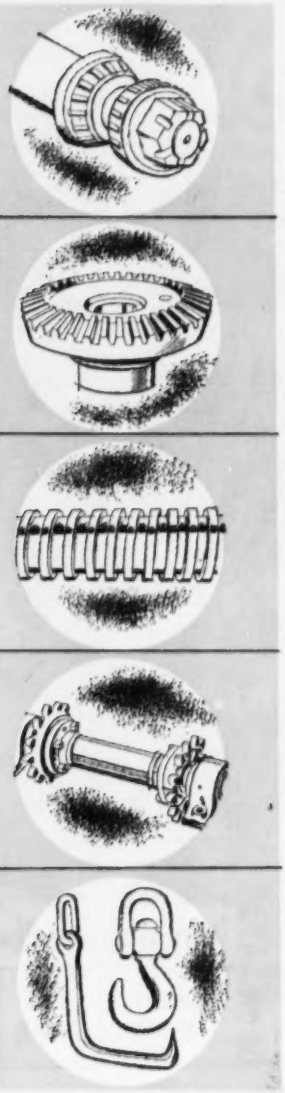
AXLES

GEARS

JACK LIFTING SCREWS

SHAFTS

HANDLING TOOLS



...AND YOU CAN MACHINE EVEN INTRICATE PARTS FROM HEAT-TREATED AND STRESS-RELIEVED BARS

Max-el 3½ is the ideal general-purpose steel for mining and construction shops. It has all the properties needed for rugged applications: toughness, strength, resistance to wear and impact. More than that, you can buy it from your nearby Crucible warehouse in heat-treated and stress-relieved bars — in the diameters and lengths you need — which do not require final heat treatment after machining.

Factors like these enable you to speed up repairs whether you make them in the field or in the shop. As a result, you cut down-time and repair costs — get your equipment back on the line faster. Then, too, parts made of Max-el 3½ last longer even on jobs where they're in continual rugged service.

Because of Crucible's methods of manufacturing and quality control, Max-el 3½ is made in extremely accurate sections and straighter bars, in a complete range of sizes and shapes. All Crucible warehouses carry complete stocks so that, in many cases, you get 24-hour delivery of whatever quantity you need.

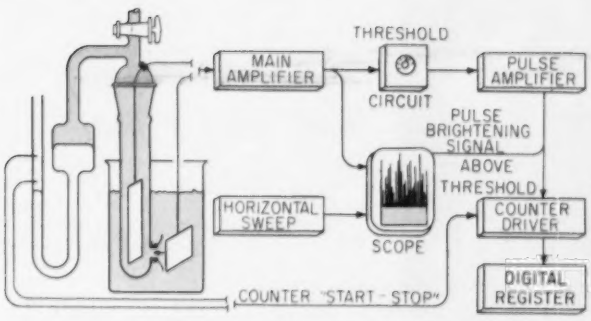
Like more information? Write: *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

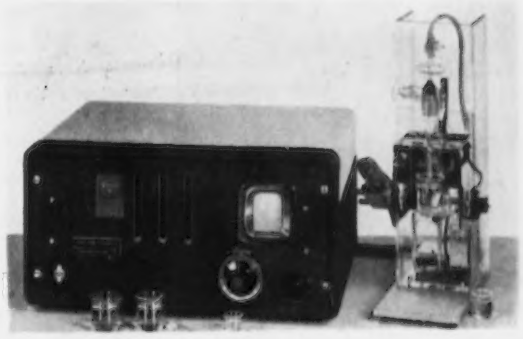
CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

E&MJ NEW PRODUCTS DIGEST

James W. Franklin





Particle Size Distribution Counter Uses Electronics, Cuts Costs and Time (1)

Originally developed to count blood cells, the Coulter Counter offered by Coulter Industrial Sales Co., counts and measures the size of particles in a fluid suspension by forcing the fluid through an aperture having an electrode on each side.

As particles pass, aperture resistance changes in proportion to the particle size and the resultant electrical impulses are recorded and counted. In Coulter Model A, particle frequency vs particle size is obtained directly.

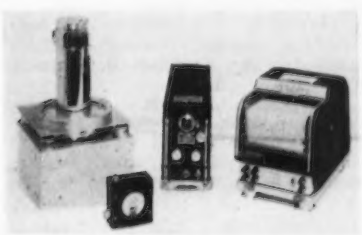
A ten point particle count and size distribution requires only about 5 to 10 minutes. Standard apertures available cover the 2 to 70 micron range, while special units are available for reading below one micron and upwards of 100.

Steel Foil Lifts Cores (3)

Geocon Ltd. states that its steel foil sampler helps lift cores from the ground without disturbing the earth. As drill is pushed into the ground, the steel tape insulates the core from the casing, making possible continuous core samplings to 130 ft.

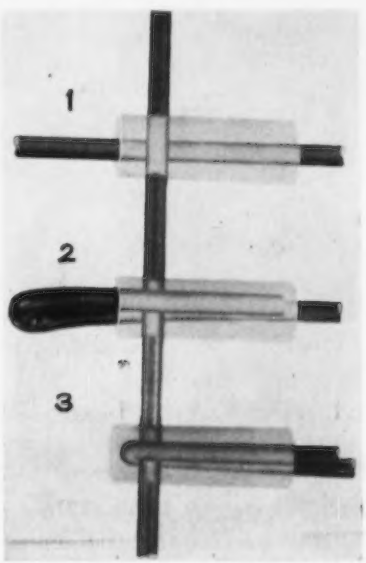
Geochemical Kit (4)

All reagents and equipment needed for geochemical prospecting sufficient for 20 analyses are included in Geochemical Prospecting Laboratory's outfit that can be used to test for zinc, lead or copper.



Airborne Scintillometer (5)

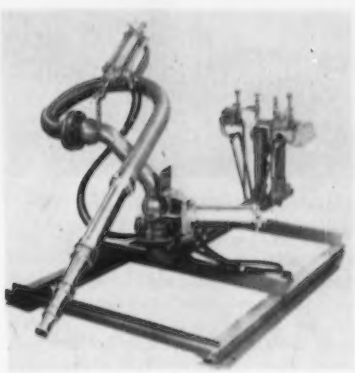
Model SC-156A by Mount Sopris Instrument Corp. offers higher count rates for a given radiation field, extended detector response at the low or soft end of the spectrum, calibrated zero displacement and increased stability.



Plastic Blasting Connector (6)

When used to join trunk and branch lines, Austin Powder Co.'s plastic connector assures a positive coupling that won't slip, loosen or lose contact. It also eliminates knot tying. Connecting is a three-step, easy operation.

Continued on page 36.
For More information, use card opposite p 42.



Three-Inch Monitor (7)

Chiksan Co.'s line of Intelli-Giant hydraulic monitors has been increased to add a small 3-in. powerful newcomer. On manual control, the 3-in. version can be handled, with one hand, at up to 300 psi. It has 270 deg traverse and 120 deg vertical sweep.

Drag Bit Head (8)

Model APA can cut through soft shale, clays, shells, limestone, red beds and other rocks having low compression strength, in half the time required with ordinary drill heads with rotary bits, according to Austin Powder Co. Carbide-tipped bits drive-fit into the drill head. Five sizes available from 4-4/8 to 8⅝ in.

Crawler-Mounted Rig (9)

Designed to provide complete power positioning in all vertical, horizontal and flat holes, Gardner-Denver Co.'s Air Trac (R) is powered by two high-torque 5-cylinder, radial air motors and can be equipped with 4 or 4½ in. drill.

Crawler-Mounted Jumbo (10)

Gardner-Denver states that the new JMT self-propelled, crawler-mounted Mobiljumbo is designed to speed high face room-and-pillar mining. Crawler can be diesel-hydraulic or 5-cylinder, radial air motor drive. Can be had with two or three creep-free hydraulic booms.

Vibrating Skip Hopper (13)

Heavy-duty, vibrating hopper designed by Simplicity Engineering Co. for rapid loading of skip hoists measures 6 ft square at the top. In operation, these units empty 15 tons of moist ore into skips in an average of five seconds. Various sizes are available.

Stoper (11)

R68 stoper, according to Gardner-Denver Co., is available with push button or rotary type feed controls. Steel changes range from 18 to 36 in. Steel sizes are ⅞ to 1 in. hexagon or quarter octagon.

Atomic-Powered Lamp (12)

Radioisotope-excited lamp that derives its power from Krypton-85 gas provides marking illumination for periods of up to 10 years without power or maintenance, according to U. S. Radium Corp. Model 535 lamp weighs only 10 lb, can be seen clearly at 500 yards. Lamps are available in blue, green, yellow or orange-red emission.

Continued on page 39. For More information, use card opposite p 42.

Underground Ore Truck (23)

Oretruck Mfg. Division, Oretruc, Inc. has a 10-ton (partly heaped) underground truck on the market, based on their earlier 6-ton model introduced last spring. Truck uses an Allison transmission and torque converter. Rated capacity is 18.5 tons on rear axle and 5½ on front. Height to highest body point is 7 ft. Loading height is 6 ft 5½ in. Maximum speed on 15% grade with heaped load is 5 to 7 mph.

Mining Equipment Briefs

Flanged mine car wheels—Hamilton Caster & Mfg. Co. has wheels in semi-steel or annealed ductile iron ranging from 5 to 15 in. dia. Can be furnished with plain or Hyatt-type or Timken tapered bearings. **(14)**

Current collector—Ohio Brass Co. O-B Type-EHD is for 35 to 50-ton locomotives drawing extremely high operating currents. **(15)**

Mobile substation—mounted on skid sled by General Electric Co., a 14½-ton 3650kva forced oil-air-cooled transformer has been installed in the strip pit at River Queen Coal Co. mine. **(16)**

Fluorescent lighting—Femco, Inc. says that their Mine-Lite system is permissible for gassy mines. Lamps operate on 230v ac, weigh only 12 lb. **(17)**

Wheat six-lamp charger—National Mine Service Co. has a charger that provides flexible taper charging for six lamps (rather than 50 or more on previous models). Lamps can be left on charge for extended periods without damage. **(18)**

Pelican clam shell buckets—Hutton Fabricating Mfg. Corp. has a line of fast-release, easy-operating buckets available. **(19)**

To thaw frozen ore—Perfection Industries offers a gas infra-red generator system for thawing frozen ore in cars. In recent test a car containing 160,000 lb of frozen (minus 30 deg F) iron ore was heated for 30 minutes, and one hour later was completely thawed. Units are installed at the Anaconda Butte operation. **(20)**

Stop dust losses in stockpile—Johnson-March Corp. says that Permaspray, a colloidal suspension in water, forms a tough, flexible, water-resistant film on exposure to air. Sprayed on outdoor stockpiles, it will resist all types of weather for a year or more. **(21)**

Extensible platform—High Ranger series of extensible platforms have a range reach of from 24 to 100 ft. Personnel can operate the hoist from the platform. Suitable for roof scaling, drilling and charge setting, says Mobile Aerial Towers, Inc. **(22)**

reduce drift support costs...

with CF&I ROCK BOLTS and REALOCK FABRIC

When you use CF&I Rock Bolts and Realock Fabric for drift support, you know you're using a method that:

- **Is fully tested for safety.**
- **Offers proved savings over older methods (35% less than timber square sets and 30% less than wedge-type bolts and landing mats, according to tests conducted by one of America's most progressive mining companies).**

Why does the combination of CF&I Rock Bolts and Realock Fabric afford such economy? First, the method is much faster and more versatile than older ones. And miners are able to do their own rock bolting with the same machines used to drive the heading. This is possible because CF&I supplies ¾" high-strength rock bolts and Pattin Type D-1 expansion shell rock bolts with left-hand threads to allow tightening by the left-hand rotation of drilling machines.

Get the complete story on how you can use the safe, economical bolt and fabric method of drift support in your own operations. Write today for complete details.

Note: CF&I Rock Bolts of the slot-and-wedge type are also available.

A twenty-minute color movie on Rock Bolting entitled "Make Mine Safety" is available for showing upon request through any of the district offices listed below.

THE COLORADO FUEL AND IRON CORPORATION

Albuquerque · Amarillo · Billings · Boise · Butte · Casper · Chicago · Denver · El Paso · Ft. Worth · Grand Junction · Houston
Kansas City · Lincoln (Neb.) · Los Angeles · New Orleans · Oklahoma City · Oakland · Phoenix · Portland · Pueblo · Salt Lake City
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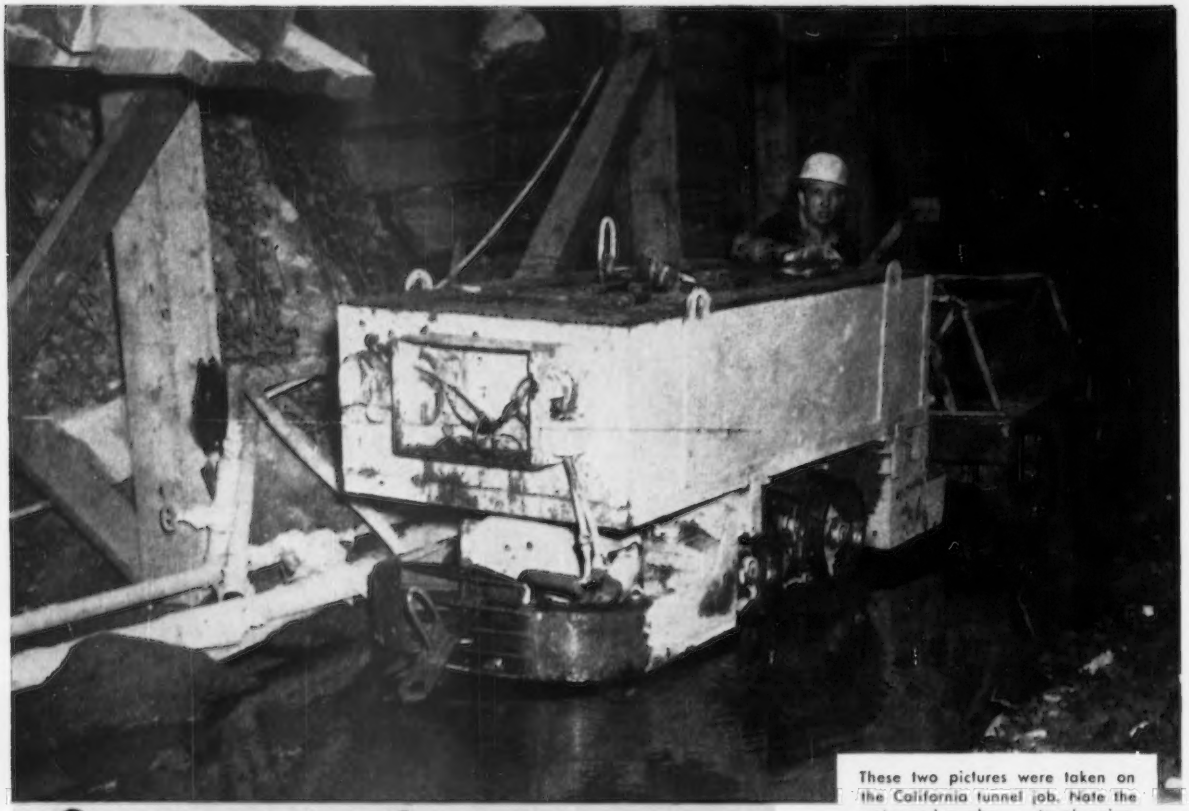
4601



These two pictures were taken on the California tunnel job. Note the water and gumbo . . . tough going, but not too tough for a Mancha.

2 Mancha locomotives... 14 years...1 mine...3 tunnels

The records show that 13 Manchas, including two Mancha 4-ton Titan A Storage Battery Locomotives, were installed in a mine development in 1942 as part of the Federal metals procurement plan.

At the termination of this project the two Titans were then used on 3 successive tunnel jobs—by Morrison-Knudson Company in Wyoming, by Grafe-Callahan Construction Company in Colorado, and by A. J. Cheff Construction Company in California.

There's a story of service . . . tough, grueling service. Tunnels must be driven on line . . . no detours around bad ground or water courses. And since assigned grades must be maintained, drainage is often inadequate resulting in poor track conditions.

Manchas are built to operate dependably under such difficulties. Extra horsepower insures continuous service without motor failures. Direct connected axles provide positive start and acceleration on wet, slippery rails. Gears are protected from muck and water by a cast steel case with 3″ clearance above rails. And the narrow Mancha design permits operation where timbering or airlock doors limit dimensions.

There you have a lot of good reasons for specifying Mancha when you buy your next locomotives. There's a Mancha type and size to meet every need. Write today for catalog.

MANCHA STORAGE BATTERY LOCOMOTIVE

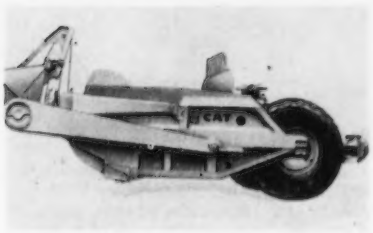
DIVISION GOODMAN MANUFACTURING COMPANY

Halsted Street and 48th Place • Chicago 9, Illinois • Cable Address: Mancha, Chicago

Mancha representatives are located in principal mining areas throughout the world.

Six-Yard Tractor Shovel (24)

Model 375A by Clark Equipment Co. can heap a 14 cu yd truck in two passes, in less than two minutes. Loader has 375 hp. No foot or engine clutch. All controls are hydraulically actuated. Power steering and power shift are standard.



Lowbowl Scraper (25)

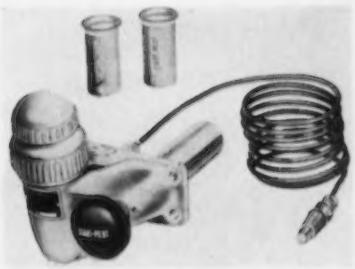
Four-wheeled scraper, No. 435 by Caterpillar Tractor Co., replaces No. 70 in the company line, and offers 38.6 sq ft of bottom area to provide a struck capacity of 13 cu yd. Heaped capacity is 18 cu yd.

Splicing Tape (26)

For connecting lines under 2000 volts, Okoweld tape by Okonite Co. serves both as insulation and sheath—no other tape required. Designed for splicing and terminating either plastic or rubber cables, the tape is weather, chemical, flame and abrasion resistant.

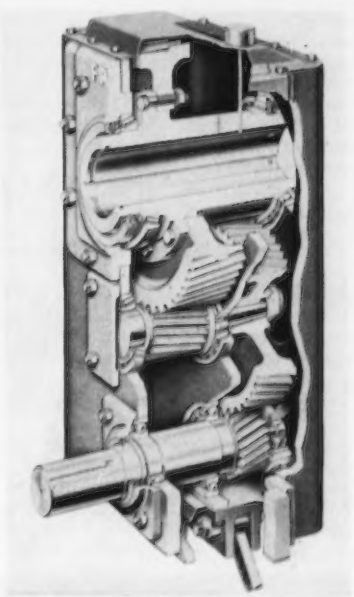
Quick Coupling (27)

Victaulic Co. now makes a quick coupling for thin wall steel and aluminum pipe and tubing. Called Vic-Easy, the coupling provides positive, leak-tight on Vic-Easy grooved pipe ends. Available in sizes from 1¼ to 12 in. dia. and usable for working pressures up to 1000 psi.



Diesel Start Pilot Device (28)

Small, compact starting device operates on cartridge-contained fuel to start and provide follow-through running for diesel engines. Unit consists of a pump, which is attached to the most convenient spot; the fuel cartridge; and fuel injection line to the piston chamber. Fuel capsule contains low ether content fuel. Start Pilot will operate at down to minus 65 deg F, according to Start Pilot Corp.



Shaft-Mounted Drive (30)

Falk Corp. announces a complete line of large capacity shaft-mounted drives. All steel 315J drives are available in single reduction ratio of 5:1 and in double ratios of 14:1 or 25:1. Unit ratings range from 2hp at 5 rpm to 50hp at 359 rpm.

Ultra-Violet Purifies Water (34)

Unit provides ultra-violet rays, including the critical 2537A wave length, that sterilize water. No taste or odor is added by treatment, and no mineral constituent is lost. No chlorine or other chemicals are used, says Sepco Corp.

Continued on page 40. For more information, use card opposite p 42.

A COMPLETE REFRACTORIES SERVICE . . . *for the Copper Industry*

Three types of basic brick—RITEX, GREFCO, STEELKLAD for the three basic processes—smelting, converting and refining. Each type of brick available in the ranges of composition—Magnesite, Magnesite-Chrome, Chrome-Magnesite and Chrome—required to adapt to variations in metallurgical processing.

RITEX—chemically bonded for low cost, superior workmanship, resistance to spalling, ready availability.

GREFCO—conventional type bonded by tunnel kiln high temperature firing, for maximum strength and hardness.

STEELKLAD—steel encased on two, three or four sides and for special jobs, steel plates incorporated in the brick interior as well—for maximum resistance to spalling in the most severely treated exposed walls.

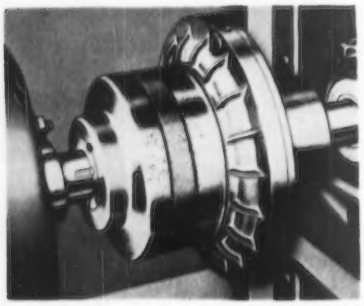
RITEX, GREFCO and STEELKLAD—each the result of many years of intimate knowledge of the copper industry and careful study of service conditions, each prepared from the best available raw materials and made with the most modern manufacturing facilities—all within easy access to your operation.

GENERAL REFRACTORIES CO.
Philadelphia 2, Pa.

GENERAL REFRACTORIES

PVC Pipe Quick Coupling (29)

Recommended for temporary chemical, oil or water lines, B. F. Goodrich Industrial Products Co.'s quick coupling pipe from Korseal will withstand high pressure, resist corrosion and is easy to assemble and disassemble. Coupling is assembled by pushing the coupling into the thrust ringseats in the groove. To disassemble, a special tool is provided that permits you to simply pull the joint apart. Available in 2-, 3- and 4-in. dia in standard 20 and 30 ft lengths.



Dry Fluid Drive (31)

Flexidyne, the dry fluid drive of Dodge Mfg. Corp., is now available in a larger size that offers use at 50% greater horsepower ratings than previous top limit. Dodge recommends the Models 15D and 15C for use with motors rated up to 75hp at 1750 rpm. Model 15D is for V-belt drive and 15C for direct shaft mounting.

Vacuum Induction Furnace (40)

Model 2551-B, 12-lb vacuum induction furnace announced by NRC Equipment Corp. has a tilt-pour crucible capacity of 72 cu in. Motor generator induction power supply, furnished with capacitor bank and switchgear, produces temperatures to 1700 deg C, or higher, depending on crucible material.

Vacuum Induction Furnace (41)

A 500-lb capacity vacuum induction melting furnace made by F. J. Stokes Corp. has been installed in Watertown Arsenal for development test work. Furnace is designed to produce metals and alloys of high purity, free from slag inclusions and gases. Molten batch is poured and cast inside the furnace.

Quick Coupling Assemblies (32)

Jordon Corp.'s Kamlok quick coupling comes in many sizes and combinations to meet coupling requirements in sizes from ¾- to 4 in. Assemblies are available in bronze, aluminum alloy, Monel and stainless steel. Kamlok offers quick, easy repair and change over, and perfect vacuum seals. No threads to engage, no lugs or tools required. A perfectly secure fit is made in seconds by sliding a coupling over an adapter and pressing the cam levers.

Wetting Agent (35)

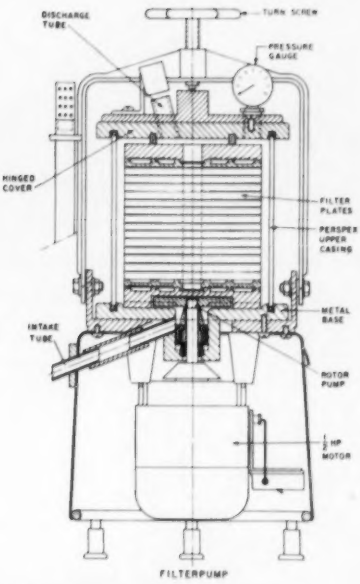
Mona Industries, Inc. now has commercial quantities of Monawet MM-80% available. MM-80% is the sodium salt of di-hexylsulfosuccinic acid and is related to Monawet MO-70%, but has better hard water and salt resistance.

Filter Cloth (36)

Filter cloth manufactured from high density polyethylene, called Polymax, is available, along with test data from National Filter Media Corp. Fabric can be used in the 230- to 240 deg F range.

Polyethylene Flasks (37)

Filtering and Erlenmeyer flasks in 500 cc size are available from Palo Laboratory Supplies, Inc. Flasks are chemically resistant at high temperatures.

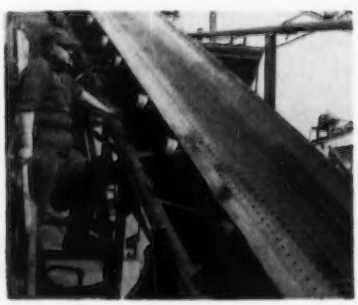


Portable Filter (43)

Plating solution filter with capacity to 900 gal per hr is announced by Hanson-Van Winkle-Munning Co. Unit has 3.5 sq ft cloth area as provided by 16 Perspex plastic plates. Perspex plastic filter media is resistant to alkalies and weak acids.

Gas Purifier (38)

Baker & Co., Inc. says that their Deoxo Dual Puridryer DMS can deliver hydrogen with an oxygen content of less than one part per million and a dew point of better than minus 100 deg F. Unit has two drying towers.



Riffle Grip Belting (39)

B. F. Goodrich Industrial Products Co.'s Riffle Grip conveyor belting can lift wet ore up an 18-deg incline. It will shed ore or rock, but retain or shed water, depending on design.

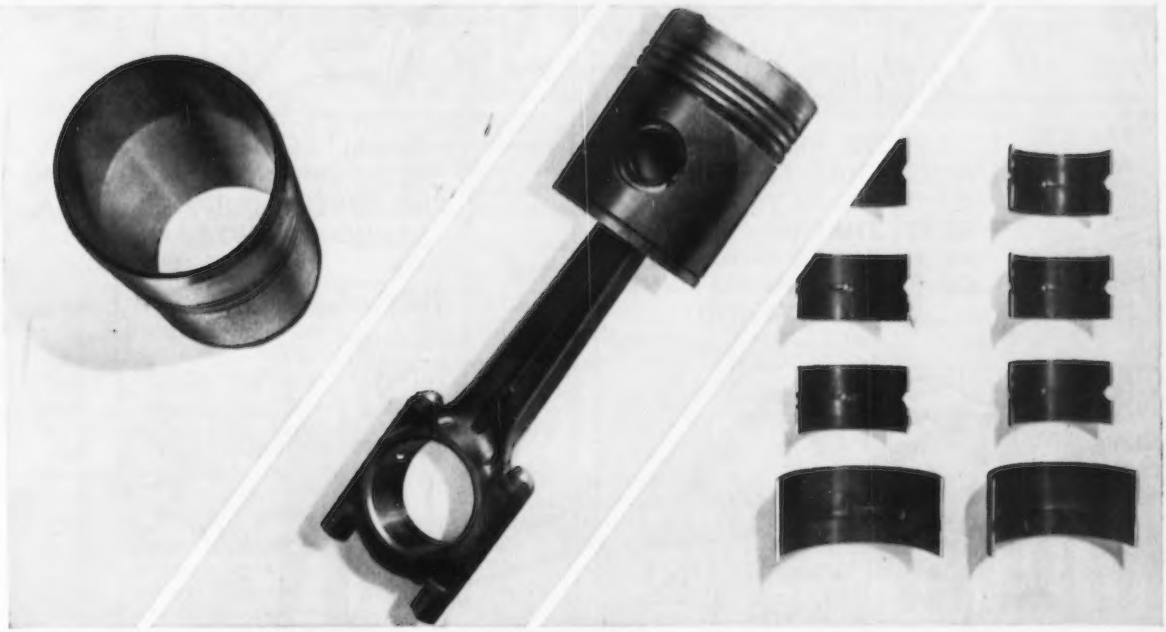
Vacuum Retort Furnace (42)

Pilot Plant Equipment Division, Lindberg Engineering Co. has developed a self-contained, complete package unit for processing small parts in a vacuum at up to 2000 deg F.

The Engineer's Field Report

CASE HISTORY
RPM Delo Oils
LUBRICANT
Progressive Transportation Co.,
FIRM Compton, California

RPM DELO holds piston wear to .001" after 201,253 miles of on-and-off highway hauling



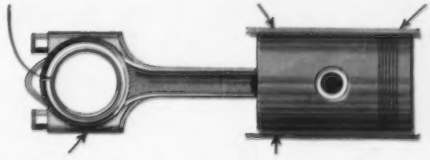
LUBRICATED WITH RPM DELO Oil, these engine parts were pulled from a Cummins HR diesel after 201,253 miles. A portion of this mileage was put on during four months of rugged service spotting loads of heavy pipe in the Arizona desert. When the engine was taken down, after two years of this on- and off-highway hauling, Progressive Transportation Co. found RPM DELO Oil had kept lacquer, gum, sludge, and deposits from forming...rod bearing wear varied between .0005 and .001 inch and pistons showed maximum wear of only .001". No wear at all evident on main bearings. Progressive Transportation uses RPM DELO Oils in all its large fleet of tractors—some of which have traveled well over 200,000 miles without overhaul.

Why RPM DELO Oils prolong engine life

Special compounds stop corrosion

Anti-oxidant resists lacquer formation

Detergent keeps all parts clean



Metal-adhesion qualities keep oil on parts in running or idle engines—inhibitor resists foaming

LUBRICATING OILS RPM DELO

For More Information... about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies below.

STANDARD OIL COMPANY OF CALIFORNIA, 225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY, P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS P. O. Box 862 • El Paso, Texas

THE CASE OF
THE OWNER WHO THOUGHT AHEAD
ART, THIS CAT* CARE SCHOOL SHOULD PAY OFF WHEN WE START ROLLING NEXT SPRING!
CAT
-AND SPEAKING OF SPRING, I'M GOING TO NEED SOME SERVICE WORK ON MY MACHINES TO BE SURE THEY'RE READY.
NOW'S THE TIME TO THINK OF THAT, TOM!
SUPPOSE WE MAKE UP A SCHEDULE FOR WINTER SERVICING OF YOUR EQUIPMENT. THAT WAY WE'LL GET THE MACHINES BACK ON THE JOB FASTER-MAKING MONEY FOR YOU.
NSON
RUCTION CO.
CATERPILLAR
SWELL! LET'S START WITH MY D6 ON MONDAY. WE'LL BRING IN THE OTHER EQUIPMENT ON A SCHEDULE AFTER THAT.
MONDAY'S FINE! NOW, LET'S MAKE A LIST OF JUST WHAT NEEDS TO BE DONE...
CATERPILLAR*
*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.
CAT CARE FOR LONGER WEAR
LET ME SCHEDULE YOUR WINTER SERVICE NEEDS FOR YOU!
Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

For More Details on New Product Items and For Copies of Free Literature Listed Below — Circle the Proper Number on Card. Be Sure to Give Your Name and Address.

For Your Files

This selected manufacturers' literature is free unless otherwise specified. If item is for sale, send request and money direct to manufacturer.

EXPLORATION AND MINING

PNEUMATIC GRAPPLE FOR SHAFT MUCKING, the Joy JPG-200, is the subject of bulletin released by Joy Mfg. Co. Operating and application details are given for most types of shafts—incline, multiple compartment, blind or offset. Grapple has 4/10 cu yd capacity according to Joy. **(50)**

MINE SHAFT EQUIPMENT in the Mayo Tunnel & Mine Equipment line is illustrated in 4-page bulletin. Koepe system is included. **(51)**

MINING TOOL CATALOG by Firth Sterling Inc. contains descriptions, dimensions and style numbers of Firth's mining machine, roof, drill and finger bits. Table lists percussion drilling grades and efficiencies. **(52)**

PUMPING UNITS for foundation testing and core drilling is the title of an 8-page illustrated bulletin available from Sprague & Henwood Inc. Units are available with any one of four power units and several drive assemblies. **(53)**

ORIENTED DIAMOND DRILL BIT catalog lists sizes, setting charges, weights and uses for all standard bits along with prices and is available from Hoffman Bros. Drilling Co. **(54)**

AIR TOOL TROUBLE CHART is included in Le Roi Division, Westinghouse Air Brake Co.'s 8-page bulletin No. AT-116B. **(55)**

HEAVY-DUTY OFFSHORE DRILLING PLATFORMS are illustrated in 6-page folder prepared by R. G. LeTourneau, Inc. **(56)**

SHOVEL DRAGLINE catalog by Ransomes & Rapier Ltd. illustrates Rapier 490 2½ cu yd machine in 24 pp. **(57)**

WHAT WE MAKE is the title of Ransomes & Rapier Ltd.'s 4-page flyer that illustrates many of the company's products. **(58)**

TRACTOR SHOVEL, Model 154, 2 cu yd, is a new line of products for Yale & Towne Mfg. Co. Six-page brochure points out the outstanding features of the unit. **(59)**

CRAWLER CRANE now available from Bay City Shovels, Inc. is described in 20-page brochure. Booklet describes features of the latest addition—1 yd, 25-ton model. **(60)**

CAR SHAKER bulletin from Allis-Chalmers Mfg. Co. is 6 pp, shows operation, design and specifications. **(61)**

WIRE ROPE CATALOG containing the complete line of Colorado Fuel & Iron Corp.'s Wickwire division, is 72 pp, gives diagrams, specifications, and describes the manufacture of Wickwire products. **(62)**

WIRE ROPE AND SLING OPERATION is a 4-page bulletin prepared by Macwhyte Co. that illustrates uses and operation of wire rope and wire rope slings. **(63)**

ABRASION is the title of Leschen Wire Rope Division, H. K. Porter Co., Inc.'s 2-page bulletin that describes the principal causes of abrasion on wire rope, and lists many practical suggestions for reducing abrasion. **(64)**

USE AND CARE OF WIRE ROPE catalog is 75 pp, tells how to select and use wire rope for best service. It is available from Macwhyte Co. **(65)**

AUXILIARY EQUIPMENT

TRANSMISSION PRODUCTS CATALOG available from Jeffrey Mfg. Co. contains 88 pp, featuring Jeffrey products, their uses and specifications. **(66)**

HYDRAULIC ACCUMULATORS produced by Industrial Hydraulics Division, Parker Appliance Co. are detailed in 35-page catalog No. 1530. **(67)**

SPHERICAL ROLLER BEARING PILLOW BLOCKS now available from Dodge Mfg. Co. are described in 8-page release. **(68)**

INDUSTRIAL TIRES AND WHEELS in the B. F. Goodrich Co. line are set down in 31-page catalog now available. **(69)**

OCT. 1957

NOT GOOD AFTER JAN. 1, 1958
if mailed in U. S. or Canada

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	15	29	43	57	71	85
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5	19	33	47	61	75	89
6	20	34	48	62	76	90
7	21	35	49	63	77	91
8	22	36	50	64	78	92
9	23	37	51	65	79	93
10	24	38	52	66	80	94
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12	26	40	54	68	82	96
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PERMIT NO. 64
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7	21	35	49	63	77	91
8	22	36	50	64	78	92
9	23	37	51	65	79	93
10	24	38	52	66	80	94
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12	26	40	54	68	82	96
13	27	41	55	69	83	97
14	28	42	56	70	84	98

Name .....

Title .....

Company .....

Address .....

E&MJ NEW PRODUCTS DIGEST (*Continued*)

POWER TRANSMISSION DATA handbook compiled and revised by Ohio Gear Co. contains charts, data and tables to help select the right gear and speed reducer. 186 pp. **(70)**

STEEL HUBS and malleable split taper bushings, the best way to grip the shaft according to Browning Mfg. Co., are listed in the company's 4-page data sheet. **(71)**

OILLESS BEARING CATALOG covering the entire Arguto Oilless Bearing Co. line is 23 pp, contains illustrated data and specifications. **(72)**

SELECTION TABLES FOR FALK SHAFT-MOUNTED DRIVES, including the new higher ratio units (20:1 and 24:1), lists class I, II and III requirements and is available from Falk Corp. **(73)**

ALKALINE RUST REMOVER strips rust, paints and asphalt finishes from ferrous metals in a one-tank operation, according to 4-page release by Turco Products Inc. **(74)**

HARDFACING ALLOYS in coils and available from Haynes Stellite Co. are described as to chemical composition, properties and applications of the six iron-based alloys and four cast tungsten carbide rods in 8-page booklet. **(75)**

STEAM CLEANERS offered by Kelite Corp. are described in 4-page bulletin. Three models are available. **(76)**

STRAN-STEEL curtain wall panels and complete structural systems are cataloged in 23 pp by Stran-Steel Corp. **(77)**

STEEL SHELVING by Penco Metal Products Division, Alan Wood Steel Co. are illustrated in 6-page bulletin No. SE-5. **(78)**

HOUR METERS for protective maintenance and use measurement for all kinds of powered equipment are described in John W. Hobbs Corp.'s 10-page catalog No. 600. **(79)**

PROJECTO-PRINTER makes transparencies for overhead projection from any original, according to Ozalid in their 6-page bulletin. **(80)**

"SPEC" MASKS for eyeglass wearers who must use gas masks are introduced in 3-page bulletin from Acme Protection Equipment Co. **(81)**

MANUAL MOTOR STARTERS for fractional and integral-horsepower motors to 7½ hp are detailed in General Electric Co.'s 8-page catalog No. GEA-6358A. **(82)**

POWDER BAGS for the mining industry are illustrated in a booklet from Chase Bag Co. **(83)**

FABRICATING THE STAINLESS STEELS is the subject of a 12-page report TIS 2818 now available from Eutectic Welding Alloys Corp. **(84)**

METAL AND MINERAL PROCESSING DATA AND EQUIPMENT

CENTRIFUGAL PUMPS for handling abrasives, corrosives and acids in the Hydroseal, Centriseal and Packless designs are detailed in Allen-Sherman-Hoff Pump Co.'s excellent 15-page brochure No. 357. **(85)**

REFINERY PROCESS PUMPS available from Peerless Pump Division, Food Machinery & Chemical Corp. are thoroughly illustrated in 11-page bulletin. **(86)**

TURBO-MIXERS for the process industry are thoroughly detailed and illustrated in Turbo-Mixer Division, General American Transportation Corp.'s 82-page release that shows application, design, uses, and cites literature references. **(87)**

AIRSTEAM CONVEYORS bulletin prepared by Dracco Corp. tells how to solve your bulk conveying problems in 28-page bulletin. **(88)**

CRUSHING, SCREENING, WASHING, LOADING AND CONVEYING EQUIPMENT available from Universal Engineering Corp. can be examined in 19-page condensed catalog. **(89)**

REVERSE JET DUST FILTER FACTS is the title of a 23-page bulletin released by Day Co. that features design, use and benefits of the Day AC dust filter. **(90)**

DYNAMIC PRECIPITATOR, American Air Filter Co.'s Type W Roto-Clone, is thoroughly described in the company's dust control bulletin No. 274B. **(91)**

DESIGN AND COST COMPARISON of heat exchangers using Wolverine Tube Division, Calumet & Hecla, Inc.'s Trufin are discussed in 19 pp. **(92)**

SPECTROCHEMICAL ANALYSIS bulletin describing a variety of prism and grating spectrographs and related accessories is 24 pp, and is prepared by Hilger & Watts Ltd. **(93)**

LABORATORY ORE DRESSING SERVICES available from Southwestern Engineering Co. are offered in Sweco's 10-page bulletin. **(94)**

PVC PIPE, FITTINGS AND VALVES in Alpha Plastics Inc. line are described in 10-page bulletin. Properties and uses are listed. **(95)**

BRONZE PRESSURE REGULATORS produced by Crane Co. are illustrated in a 6-page bulletin that stresses the improved Model No. 960 regulator. **(96)**

INDICATING AND TOTALIZING METERS from Hays Corp. are described in an 8-page bulletin. **(97)**

AMMONIA technical data book prepared by Nitrogen Division, Allied Chemical & Dye Corp. contains 68 pp of specific information on anhydrous ammonia and its uses. **(98)**

Loaded and ready for profitable blasting

PRIMACORD®
DETONATING FUSE

This hole could be one in a thousand, ready to "go" when *you're* ready to go — but not before. It is primed with Primacord, the detonating fuse which is resistant to sparks, friction, ordinary shock, stray electrical currents . . . . Even a direct hit by lightning failed to detonate it!

But a single detonator, attached to the end of the trunk line, will detonate this hole and all other holes in the hook-up. You'll get a blast you'll be proud of!

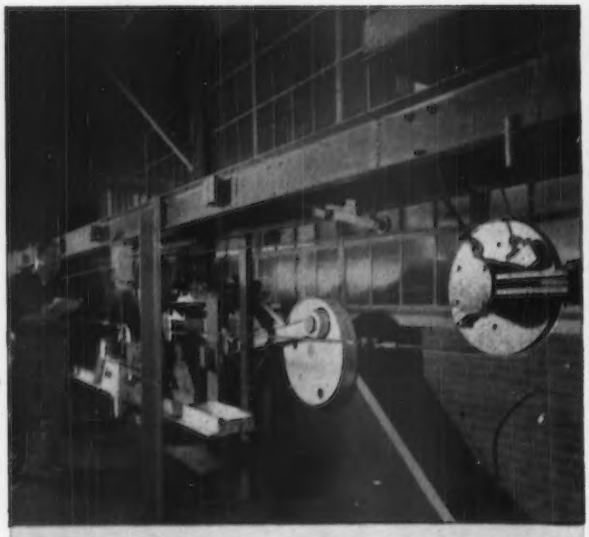
THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut • Since 1836
Primacord® and Detacord® Detonating Fuse, Safety Fuse, Ignitacord®, Quarrycord, Pyrotechnical Devices and Blasting Accessories.

The square knot is used only above ground, to lengthen a trunk line of Plain or Reinforced Primacord or to tie in Primacord M S Connectors. It must be drawn up tight.

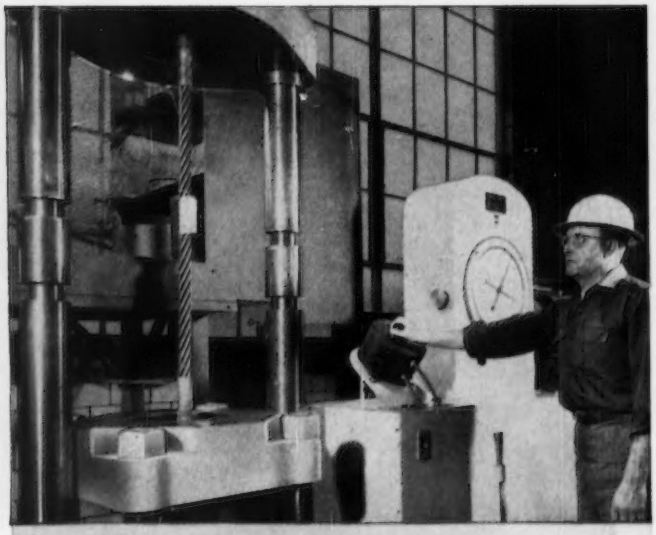
Plain Primacord Trunk Line — Used also for shallow holes — wherever resistance to abrasion and cutting is not required. Textile covered, flexible, resilient, with a "tacky," non-slip surface. Tensile strength 140 lbs. 1000-ft. spool weighs 17 lbs.

Reinforced Primacord Branch Line — recommended for deep holes where normal strength and resistance to abrasion and cutting are needed. Textile reinforced (yellow with red thread), tough, resilient, flexible. Tensile strength 170 lbs. 1000-ft. spool weighs 18 lbs. The knot shown is the double-wrap half hitch, made in the branch line and drawn tightly around the trunk line.

Why J&L wire rope service life



Fatigue machine. This 6 x 25 I.P.S. fiber core rope is being subjected to a continuous fatigue test to determine the number of reversed bends before breakage.



Cross-section tension test. This 1¼" 6 x 41 I.P.S.-RL fiber core rope was tested to 140,000 lbs. tensile load. Catalog requirement for same rope is only 123,000.

Vibration fatigue test subjects this boom pendant assembly to repeated shock loading. The 2,500 ft. lb. load provides action simulating actual field conditions.

Tension test of individual wires shows pounds of tensile load withstood before breaking. Every coil of wire used in J&L wire rope is thoroughly tested before acceptance.

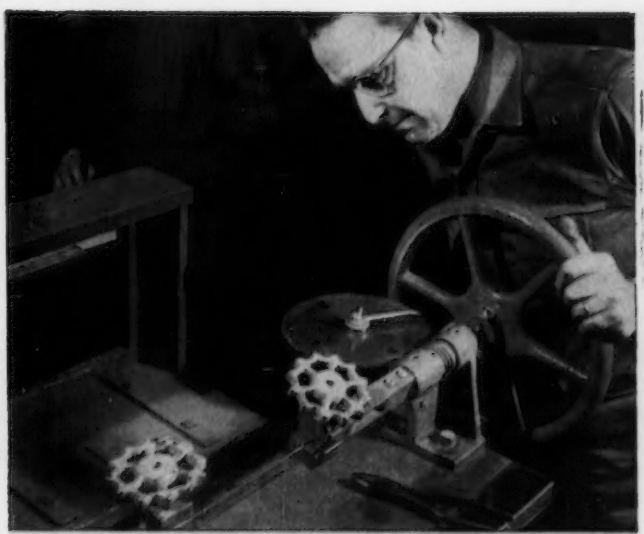
salesmen can talk with confidence

To users and buyers of wire rope, safety and long rope life are all-important considerations. When you specify J&L, you can be confident you are buying wire rope that will stand up to the job for which it is made.

Every strand of J&L wire, every finished wire rope, is subjected to exacting tests to determine maximum factors of strength, flexibility, abrasion and corrosion resistance. This quality control is a most important operation in the production of J&L wire rope. Shown here are some of the tests that enable your J&L wire rope salesman to talk about quality with confidence.

The next time you buy wire rope, call your nearby J&L representative, or write direct to the Jones & Laughlin Steel Corporation, Wire Rope Division, Muncy, Pennsylvania.

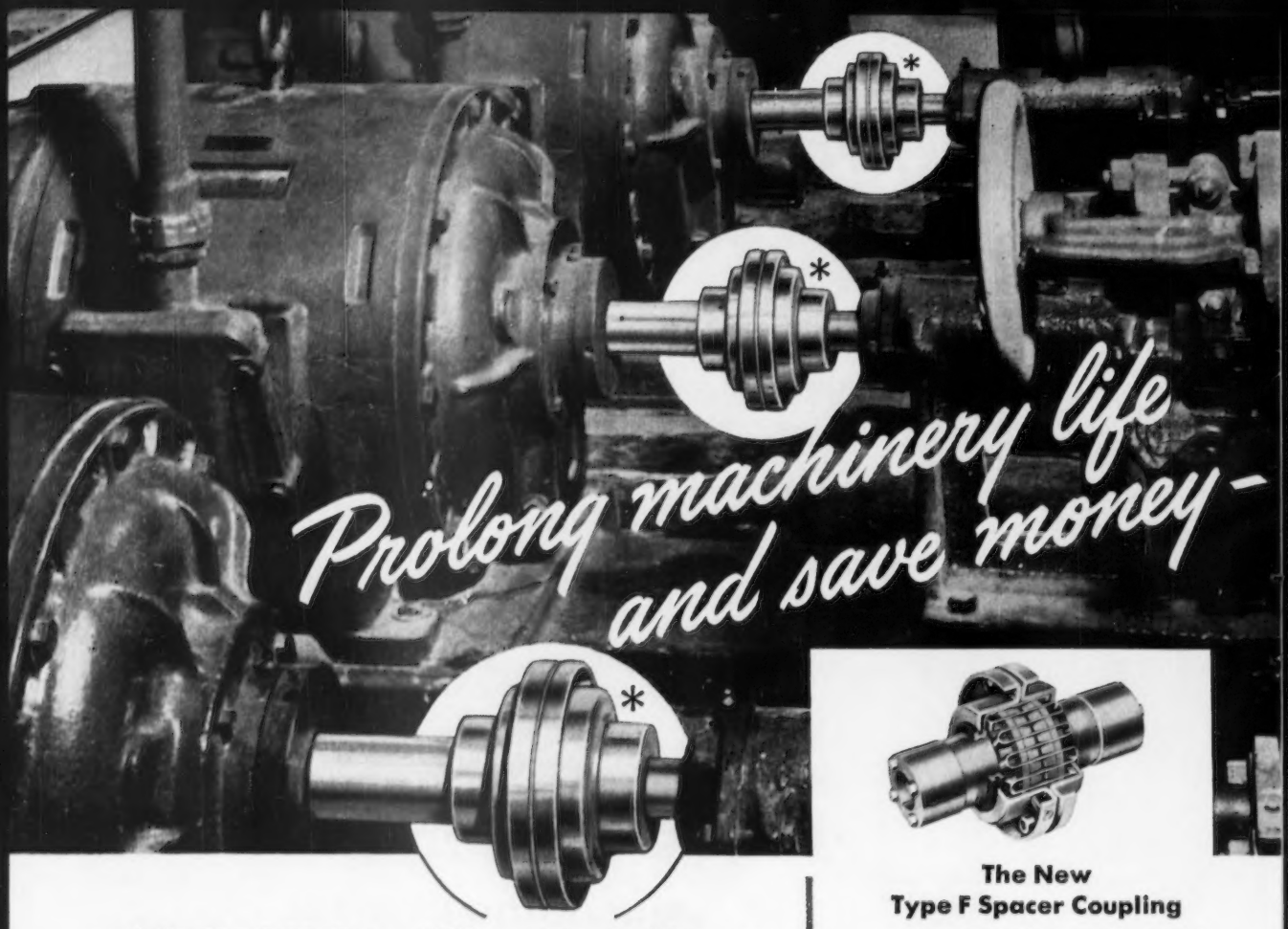
Jones & Laughlin
STEEL
. . . a great name in steel



Torsion machine tests ductility by twisting wire. This 8" length of .081 wire took 41 revolutions before snapping. Federal standards require only 26 revolutions.

Wrap test. Galvanized wire is wound eight times around a mandrel of its own diameter and then unwrapped, proving ductility of wire and the bond of the coating.

(Protective screens removed during photography.)



Prolong machinery life and save money—

with FALK Steelflex Couplings

Ever since the first Falk Steelflex Coupling was designed and built, we have firmly held to these beliefs:

1. A coupling, to give fullest value, must do more than merely *connect* driving and driven machinery—it must *protect* the machinery and prolong its life.

2. A coupling, to be truly flexible, must overcome the effects of shock and vibration, as well as shaft misalignment.

Proof of the soundness of those beliefs is furnished by the record. More than one million Falk Steelflex Couplings have been used on every conceivable type of industrial application . . . giving trouble-free service, providing maximum protection to connected machinery.

* A single basic type—the famous Type F—fills 90% of all industrial application needs. It is versatile, efficient and economical. And—it is always available from factory, field or distributor stocks, in a wide range of sizes.

Write to Department 247 for engineering bulletin, including selection and dimension tables.

THE FALK CORPORATION, MILWAUKEE, WISCONSIN

MANUFACTURERS OF:

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

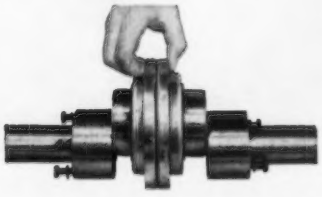
...a good name in industry

The New Type F Spacer Coupling

Here is a Steelflex coupling specially designed to permit fast, easy installation and removal in horizontal and vertical applications where it is impracticable to move the connected units—or where a space-gap (up to 12 in.) is necessary.

Like all Steelflex couplings, the Type F Spacer gives long, trouble-free service and maximum 3-way protection for connected machinery: it provides torsional resilience to reduce shock and vibration; it accommodates parallel or angular shaft misalignment; it allows free (or limited) end float.

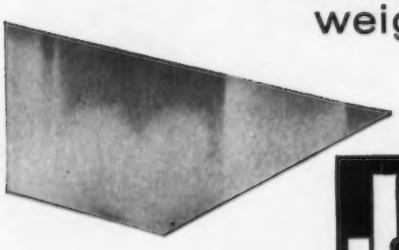
An outstanding feature of the Steelflex Spacer is that it can be installed or removed in one piece (see photo below); no dismantling or servicing of the coupling is required. Pump assemblies can be disconnected and removed without disassembling the coupling, without exposing working parts.



The Steelflex Spacer coupling is prelubricated at the Factory and can be installed, or removed and reinstalled, without disturbing the lubricant—a highly desirable feature.

JALTEN low alloy high-strength J & L steel

provides equal strength with lighter weight



Jalten permits high design loads with reduction in section. Usual reduction is two gages with weight saving as much as 25%.

High strength of Jalten is the result of balanced chemical composition which is carefully controlled during production. Jalten's strength is retained through fabrication and welding without further heat treatment.

Jalten is available in the forms you require (plates, hot rolled sheets, hot rolled bars, small shapes and structurals). Jalten can be purchased in three grades to meet specific requirements for high strength, formability, impact, resistance to corrosion.

Your local distributor can supply you with information on Jalten, or you can write direct to the Jones & Laughlin Steel Corporation, Dept. 412, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J&L STEEL

Jones & Laughlin
... a great name in steel

WATCH FOR FIRESTONE WHEN THE HEAVYWEIGHTS ROLL!

Firestone Tubeless Rock Grips are performance champs on big jobs!

Firestone Tubeless Rock Grips knock down operating costs. Two great tread designs match toughness with traction to ward off all the bruising punishment the meanest terrain can dish out. Rock Grips cut down time-wasting tire changes because they're built for *all* types of terrain. You get *full flotation* to stay "on top" in sand and soft stuff, plus super-strong *armored grip* to take punishing runs over broken rock day after day. Safety-Tensioned *Gum-Dipped*® NYLON bodies, combined with cut-resistant treads, make these heavyweight haulers first choice for off-highway users. Your Firestone Sales Engineer will be glad to show you why they'll be your first choice, too. Contact him today through your local Firestone Store or Dealer.

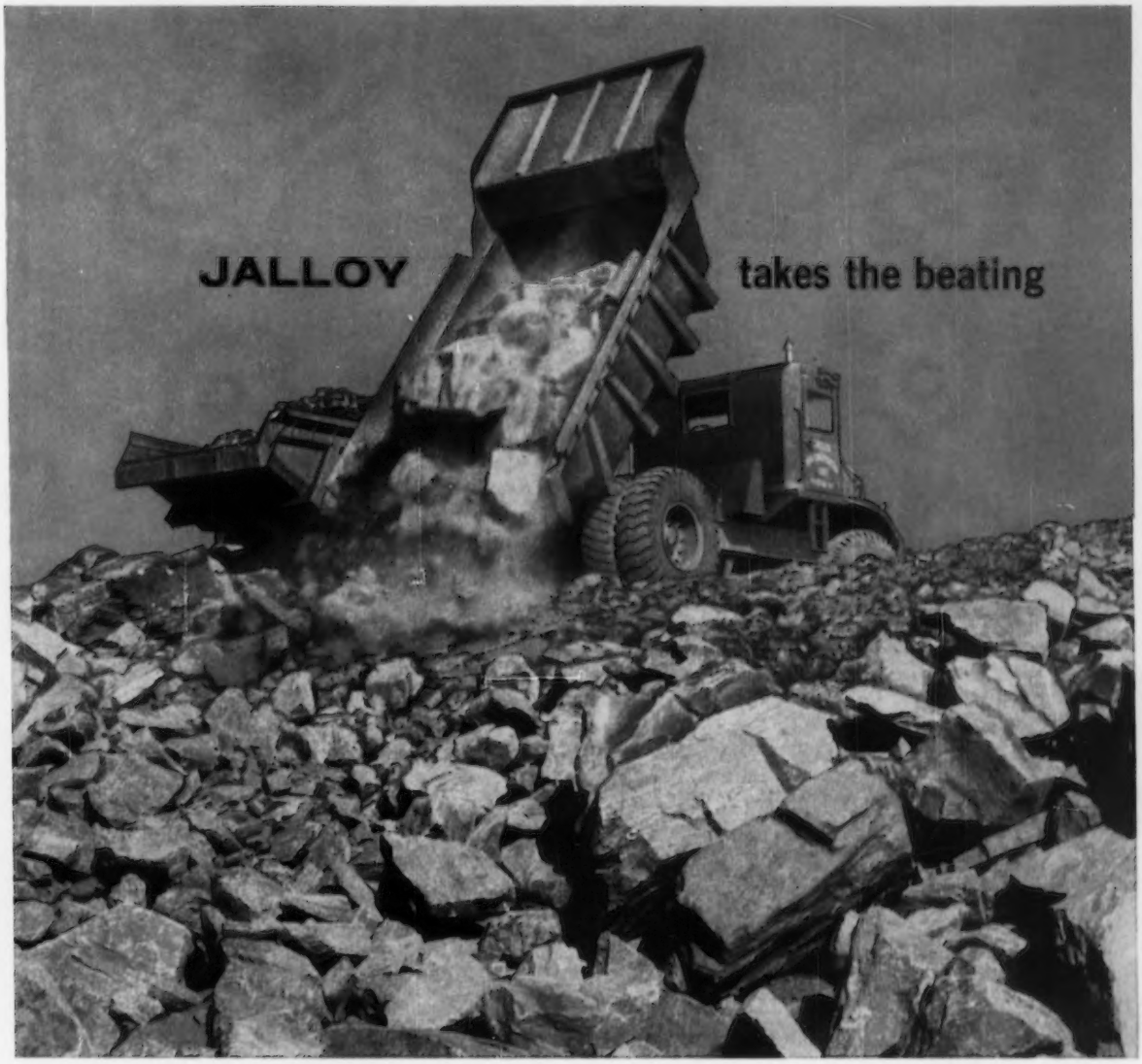
ROCK GRIP WIDE BASE ROCK GRIP

Enjoy the Voice of Firestone on ABC television every Monday evening.

Firestone

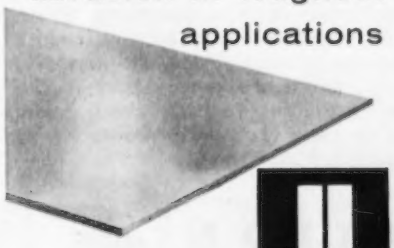
BETTER RUBBER FROM START TO FINISH

Copyright 1957, The Firestone Tire & Rubber Company



JALLOY special alloy steel

resists impact and abrasion in toughest applications



Heat treated Jalloy steels wear as much as 20 times longer than mild steels under rigorous impact and abrasive conditions. By using Jalloy you can cut maintenance cost drastically. Increased product life reduces downtime and lowers your labor costs.

Jalloy steels are available in the forms you require (plates, hot rolled sheets, hot rolled bars, small shapes and structurals). Jalloy can be purchased in three grades to meet specific use requirements: Grade 1, where formability is important; Grade 3, capable of being heat treated to excellent physical properties for good resistance to abrasion or wear; Grade 7, for high hardness with good ductility or wear resistance.

Your local distributor can supply you with latest information on these Jalloy grades, or you can write to Jones & Laughlin, Dept. 412, 3 Gateway Center, Pittsburgh 30, Pa

J&L STEEL

Jones & Laughlin

. . . a great name in steel

EIMCO 40-H CONVEYOR LOADER

EIMCO 630 TRACTOR-LOADER

EIMCO 21 LOADER

EIMCO 12B LOADER

Crawler or Rail Mounted . . .

There s An Eimco Mucking Machine For Your Drift and Mining System

An Eimco 630 Tractor-Loader mucked inside an 18′ circular shaft in Wyoming and a large rectangular shaft in West Virginia. On basis of its performance, it was publicized as follows: "This machine maneuvers well in confined space and readily loads into shaft buckets. It seems to offer many advantages in shaft mucking, loads faster than a clamshell and is safer to operate".

In Eastern U. S., an Eimco 21 rail-mounted loader was instrumental in the early completion of a 6250′ x 8′ diameter tube that will bring fresh offshore water from a lake to city mains. It worked around the clock, tossing 30 yard rounds of rock (brought down 6 times every working day) over its back into 1 yard end-dump cars.

Operating in rock development work for a large German mining firm, 5 Eimco 40-H rail-mounted conveyor loaders have driven 12½ miles with a combined downtime equivalent to less than two working days.

In England, rail-mounted 12 B's - Eimco's smallest mechanical loader — muck slate in a small diameter heading. The discovery: "Loading with Eimco 12 B's has many advantages over chute and grizzly system. It's faster, safer and more economical".

In mining and tunneling operations throughout the world, Eimco mucking machines continue to establish new production records under tough, grueling service.

There are many profitable reasons for specifying Eimcos when you buy your next mucking machines. And there's an Eimco type and size of mucker to meet your drift and mining system needs. Write today for full information.

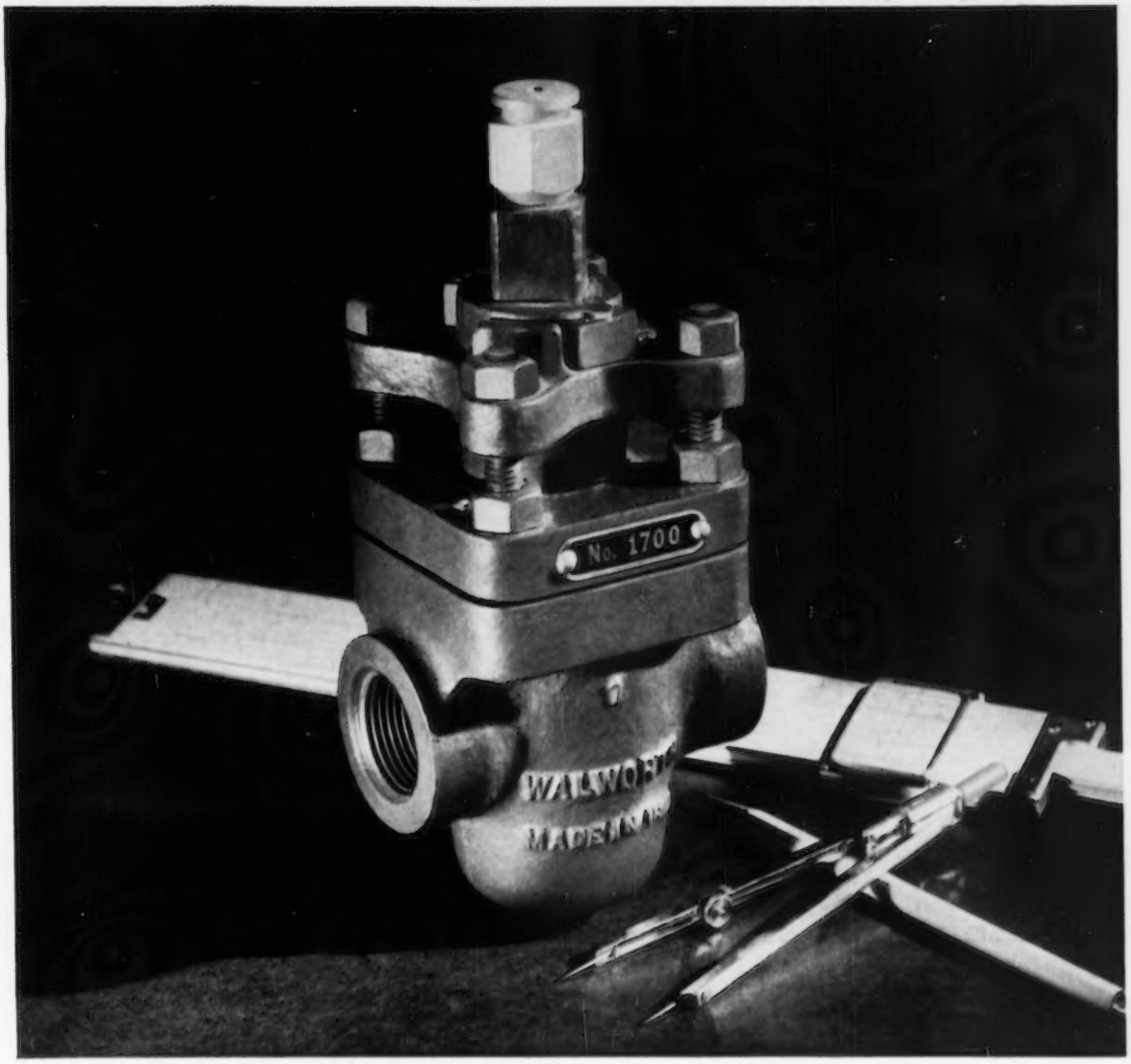
THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

New York, N. Y. Chicago, Ill. San Francisco, Calif. El Paso, Tex. Birmingham, Ala. Duluth, Minn. Kellogg, Ida. Pittsburgh, Pa. Seattle, Wash.
Cleveland, Ohio Houston, Tex. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-280

Illustrated here is the Walworth Lubricated Plug Valve No. 1700, available in sizes from ½" to 5" inclusive, suitable for 200 pounds water, oil, or gas working pressure.



problem-solvers for tough jobs

*LPV's by WALWORTH

If you're familiar with the basic advantages of Plug Valves, you know why Walworth Lubricated Plug Valves work so well in really tough spots. You know about their direct port opening . . . their dead tight shut off. Seating and sealing surfaces are fully protected from attack by fluids being handled by insoluble lubricants.

*Lubricated Plug Valves

Remember, you can get Walworth LPV's in all sizes . . . from ½ to 30 inches . . . for pressures up to 5000 psi and for vacuum service . . . in a number of different styles and patterns. For more information about LPV's and for your copy of the new Walworth LPV Circular, see your local Walworth Distributor.

WALWORTH

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

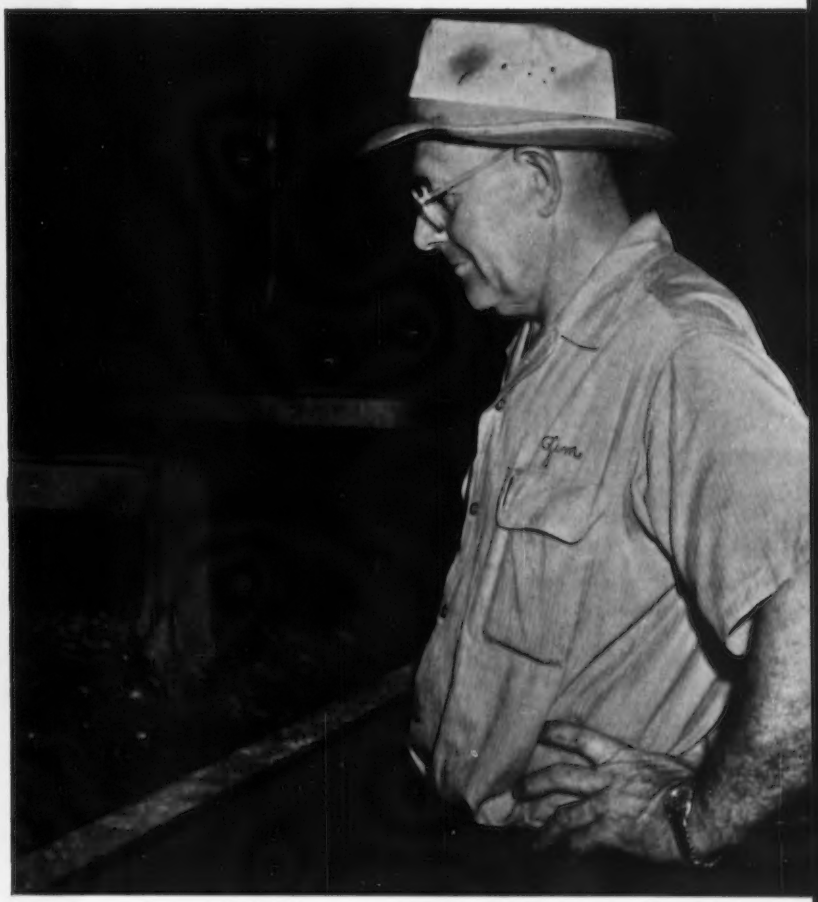
WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. SOUTHWEST FABRICATING & WELDING CO., INC. • M&H VALVE & FITTINGS CO. • WALWORTH COMPANY OF CANADA, LTD.

From the lab to the mill...

Whether you are developing the flow scheme for a new ore body or seeking ways to improve your present reagent combination, Cyanamid Field Engineers can give you very practical help.

They can bring you access to a vast reservoir of data on processes and reagent combinations proved most effective in mills all over the world. This operating data is supplemented by the work of Cyanamid Mineral Dressing Laboratory where basic research on better reagents and application methods goes forward unceasingly.

Cyanamid serves the mining industry!



Whether you can best use flotation, cyanidation or a combination of these processes, the Cyanamid Field Engineer will work with you in your own lab work, on your pilot plant tests and in your mill to achieve the most efficient reagent set up for lowest cost-plus-tails on your ore.

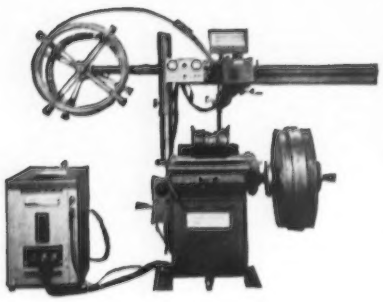
This shirt-sleeve help is an additional value freely offered to users and prospective users of Cyanamid Reagents. A letter or phone call to our nearest office will have prompt attention.

CYANAMID

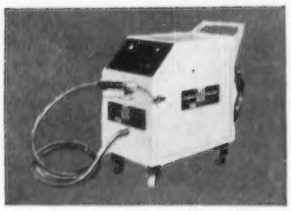
AMERICAN CYANAMID COMPANY
MINING CHEMICALS DEPARTMENT
30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.

How AMSCO helps you fight wear...

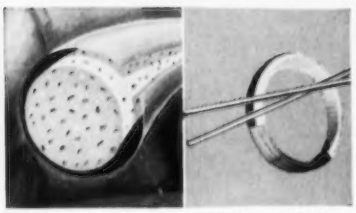
AMSCO® HARDFACING WELDING EQUIPMENT AND MATERIALS



Automatic welders

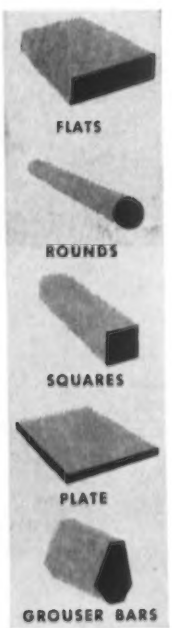


Semi-automatic MF welders



Manual, automatic rods & electrodes

Now you can get a hardfacing material to lick every type of wear. Impact alone! Impact plus abrasion! Abrasion alone! Amsco's line is complete and includes the new high-speed, more economical *tube rod* for semi-automatic build-up and repair. You'll save hours of down time, reduce welding time and materials cost . . . plus extending service life of your equipment . . . by using Amsco machines and hardfacing materials. Write for a complete description of this wear-fighter line.



AMSCO SHAPES • REPOINTERS

of 12-14% manganese steel

Reinforce points of extreme wear with work-hardening Amsco 14% manganese steel shapes. Truck beds, chutes, crushers, blades, dippers . . . wherever impact and abrasion cause early wear-out. Amsco shapes are easy to weld, manganese to manganese, or manganese to carbon steel. Size range is complete to fit all equipment.

Cast-to-shape repointers

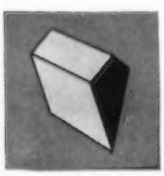
For fast, easy repointing of teeth used in less severe digging.

Repointer bars

Three-foot bar lengths. Also ideal for rebuilding worn lips of all digging equipment.

Wear-Sharp repointers*

Work up to 6 times longer than standard repointers. Corners won't blunt. Entire cutting edge wears evenly. **Patented*

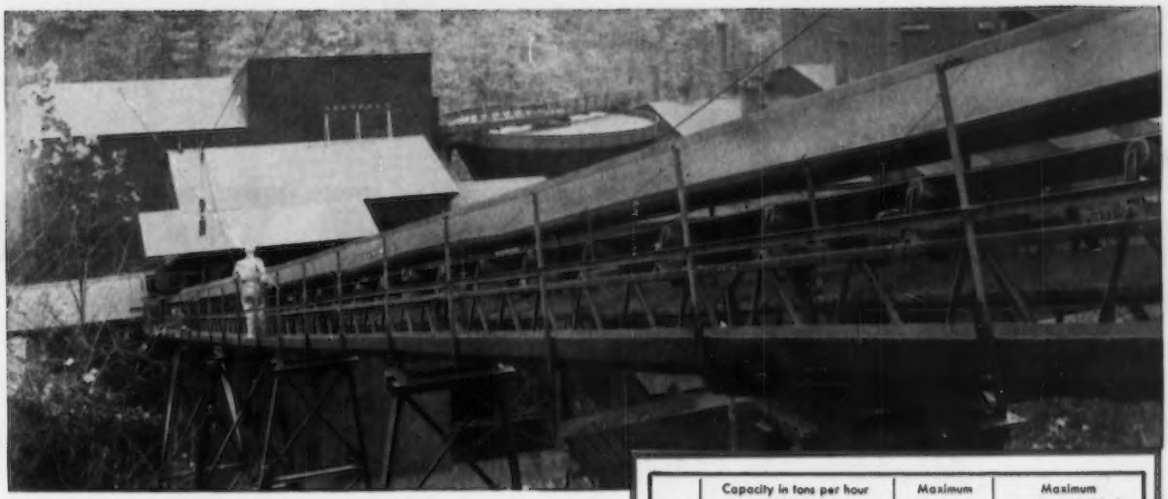


Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

AMERICAN Brake Shoe COMPANY

AMSCO

AMERICAN MANGANESE STEEL DIVISION
CHICAGO HEIGHTS, ILLINOIS

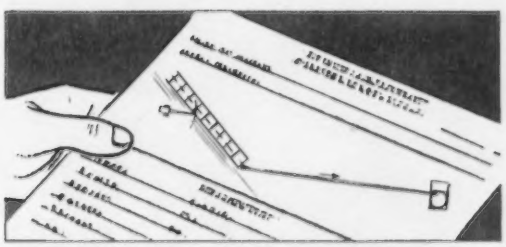


For lower costs down the line
make your belt conveyors

PRE-BILT by LINK-BELT

Belt width, inches	Capacity in tons per hour at belt speed of 100 FPM			Maximum lump size, inches		Maximum recommended belt speed, FPM	
	Weight of material, lbs. per cu.ft.			Sized	Unsized	Half maximum size lumps	Maximum size lumps
	50	75	100				
18	27	40.5	54	3	5	400	300
24	50	75.0	100	4½	8	500	400
30	81	121.5	162	7	10	600	450
36	117	176.0	235	8	14	650	500

EASY SELECTION. Your Link-Belt engineer will help you choose the best combination from a wide selection of PRE-BILT sectional belt conveyor components.



PROMPT ESTIMATES. From standardized data, an "on-the-site" quotation can be prepared covering the components for your needs.

SPEEDY DELIVERY. Standardized parts are shipped from the nearest of 8 plants. One-source availability eliminates the delay of coordinating purchases from several suppliers.

FAST INSTALLATION. Due to simple construction and shop-assembled components, you can do your own erecting. Link-Belt also furnishes complete erection service and supervision.

Link-Belt PRE-BILT sectional belt conveyors combine operating efficiency and economy to give you years of dependable, profitable operation.

For full information on these durable conveyors up to 36 in. wide—with drives up to 40 hp, 24 and 42-inch truss depths—contact your nearby Link-Belt office, or send for Book 2579.

LINK-BELT

BELT CONVEYORS

14,702

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

Nordberg

GRINDING

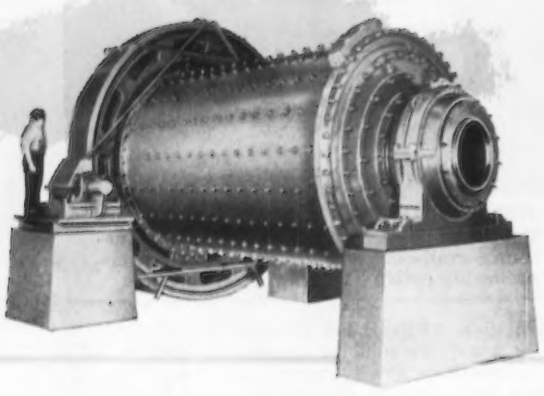
. . . built to meet the exacting requirements of the MINING INDUSTRY

NORDBERG MACHINERY is the result of specialized engineering skills aided by unsurpassed manufacturing facilities. For over half a century Nordberg has produced heavy machinery for the mining industry, which has become well known all over the world for its advanced engineering, excellent construction, high efficiency and dependable service.

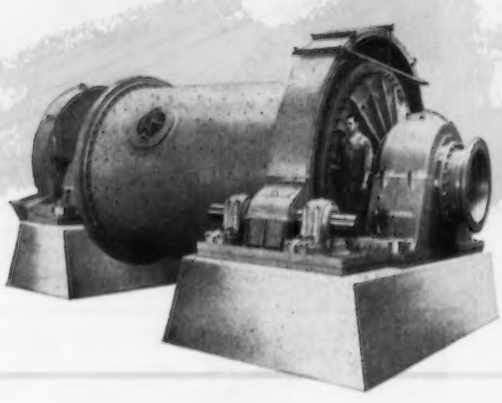
Included in this broad line of heavy machinery is the complete line of Nordberg Grinding Mills, designed and built to meet the most exacting requirements of the mining industry . . . for wet or dry grinding of metallic and non-metallic minerals, and in other processes where friable material must be comminuted to fine sizes.

Nordberg Grinding Mills are manufactured in sizes ranging from 6 to 13 feet in diameter and up to 50 feet in length. Types include Ball, Pebble, Rod, Tube and Compartment Mills.
Write for further information.

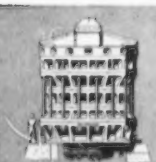
NORDBERG MFG. CO., Milwaukee, Wisconsin



• Typical Nordberg dry grinding Rod Mill, measuring 10′-6″ in diameter by 16′ in length, for ore processing service. Mills of this type are in wide use in the mining industry, delivering maximum output at lowest possible cost.



• View showing discharge end of Nordberg 10′-8″ x 17′ wet grinding Ball Mill with Scoop Feeder. Whether wet or dry process, open or closed circuit operation, there is a Nordberg Grinding Mill built for the job.



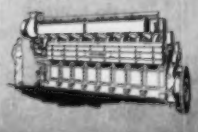
SYMONS GYRATORY CRUSHERS

SYMONS CONE CRUSHERS

NORDBERG KILNS AND COOLERS

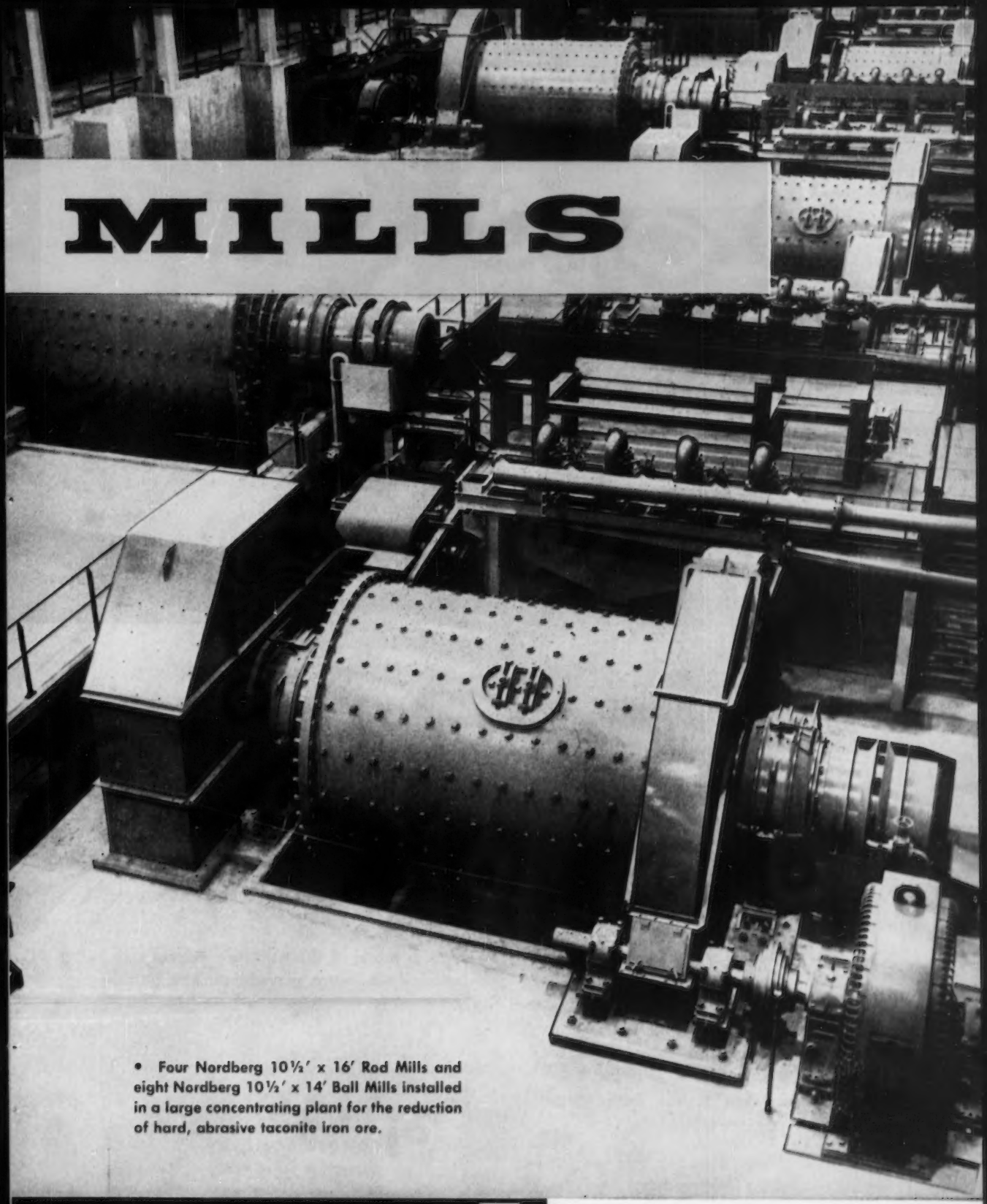
NORDBERG MINE HOISTS

SYMONS VIBRATING GRIZZLIES AND SCREENS



NORDBERG DIESEL • DUAFUEL® and SPARK-IGNITION GAS ENGINES

MILLS



• Four Nordberg 10½′ x 16′ Rod Mills and eight Nordberg 10½′ x 14′ Ball Mills installed in a large concentrating plant for the reduction of hard, abrasive taconite iron ore.

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • ST. LOUIS • DULUTH • WASHINGTON
TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG

SYMONS . . .

A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD

© 1956, Nordberg Mfg. Co.

GM-156

1 1,790,000 lb. charge of Amocol ammonium nitrate blasting agent primed with 60% Extra dynamite erupts with controlled violence to break and displace over 2,500,000 cubic yards of quartzite, the largest industrial blast in the nation's history.

Making mincemeat out of a mountainside . . .

THIS BLAST BROKE ALL RECORDS!

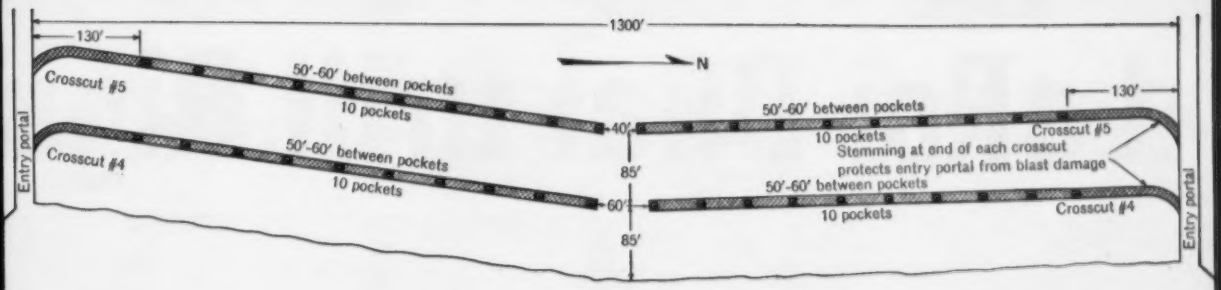
Two-and-a-half million cubic yards of rock broken by one construction blast! That's the record-smashing result achieved this summer at Little Valley, Utah, in the world's largest non-atomic blast.

Morrison-Knudsen Company, Inc., scored this industrial record with 1,790,000 lbs. of Atlas Amocol blasting agent and Atlas 60% Extra dynamite, detonated in two 1,300-foot coyote crosscuts driven from permanent entry portals (see sketch).

M-K engineers directing this project estimated that the blast produced over a tenth of the rock needed for the 13-mile causeway being built for the Southern Pacific railroad across the Great Salt Lake at Promontory Point.

Atlas is proud of the part its products and technical assistance played in making this historic blast a success.

EXPLOSIVES DIVISION
ATLAS POWDER COMPANY
WILMINGTON 99, DELAWARE
offices in principal cities



Plan of portals and crosscuts 5′ x 7′

Height of burden from floor of crosscuts 200′

■ Explosives pocket

▨ Sand stemming

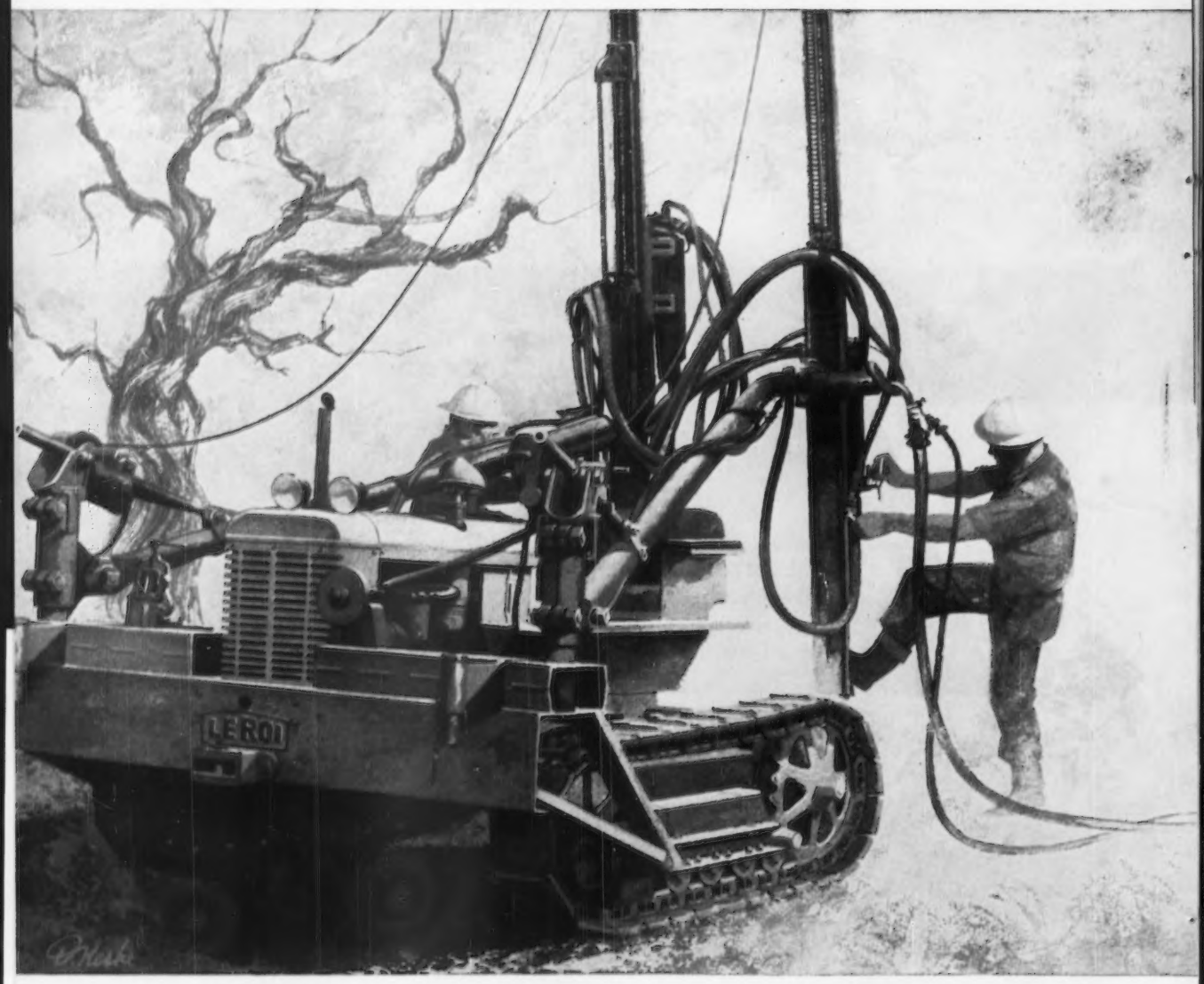
Amount of explosives used:	
Atlas Amocol	1,432,000 lb.
Atlas 60% Extra dynamite	358,000 lb.
Total	1,790,000 lb.
Amount of rock produced	2,500,000 cu. yd.

2 The two 1,300-foot coyote crosscuts were fired 25 milliseconds apart with Rockmaster electric blasting caps attached to the detonating fuse connecting individual charges within each tunnel. The crosscut nearest the face was fired first to provide relief for the second.

3 Muckpile shows uniform breakage and excellent displacement. Nearby buildings and equipment are untouched by throw. Only blast damage was to adjacent power and telephone lines which were purposely allowed to remain in shot area to minimize replacement costs. The rock will provide solid fill for causeway and also will be used as riprap in final stage of construction.

T-286 unit features more power and speed

LeRoi Dual Drill Rigs



Check these comparative features!

mobility:

1.

The T-286 can quickly speed across job-sites without compressor power.

The air-driven track-type wagon drill can't move without an air compressor — must be loaded and unloaded by a crane.

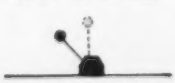
2.

The T-286 unit can travel 7 mph — and pull the compressor, too!

The air-driven unit can only travel 3 mph.

3.

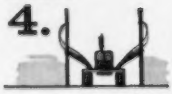
The T-286 has three forward speeds for better control, faster movement.



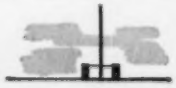
The air-driven unit has but one forward speed.

cost:

4.



The T-286 costs 20% more than an air-driven track-type wagon drill, BUT you get two drills instead of one—twice the production!



5.

The T-286 tractor unit alone costs slightly more than the track-type drill carrier, but it has extra usefulness—does other tractor work when not drilling.

T-286 unit features more power and speed for quicker positioning than track-type wagon drills.

Out-perform All Others!

Air motors do all the drill positioning, relieve most of the manual work

The Le Roi T-286 is a dual-drill rig mounted on a 28 hp crawler tractor. It gives you twice the production of competitive single-drill self-propelled units — yet costs only slightly more.

Its power and speed exceed that of other crawler wagon drills, giving faster movement across job-sites . . . quicker positioning . . . higher production.

Besides being a major time-saver, the tractor is useful after rock-work is completed; drills can be easily removed to permit use in cleanup work and other odd jobs. Yet the tractor itself costs only slightly more than a slow-speed air-driven self-propelled drill carrier!

Goes Anywhere

The T-286 is ideal for work-sites that are inaccessible to standard-type drill rigs. It can easily travel to places where manual positioning of wagon drills is slow and impractical — quickly reaches spots formerly drilled only with even slower and doubly back-breaking hand-held rock drills!

The crawler tractor takes rough ground easily. A parking brake and two leveling jacks stabilize the tractor while drilling on rough or uneven ground.

In operation, air motors position the drill arms through a wide arc, permitting easy, quick setups for any number of holes without relocating the machine. Each arm has a 7 ft. radius through 220 degrees . . . distance between drills is a maximum of 24 feet, allowing a variable drill pattern.

Drills High or Low Holes

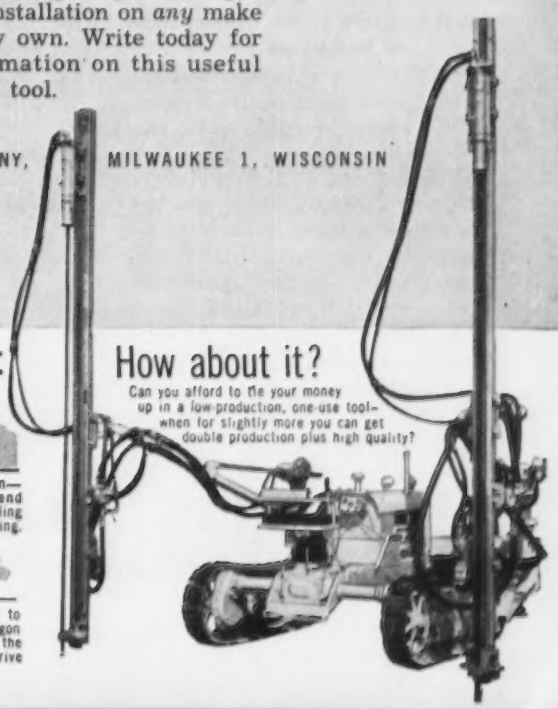
Air motors change the positioning of the air feeds, too, through 360 degrees. This means easy placement of horizontal flat holes as high as 9 feet above ground level, as well as toe holes either backward or forward. Feed is positive whether the drill is being fed forward or retracting, giving faster drilling with both steel and tungsten carbide tipped bits.

The heavy-duty feed allows the use of either 3½ in. or 4 in. drifter with 10 ft. travel and 8 ft. steel change as standard equipment. Other size steel changes are available.

The dual drill rig may be bought separately for installation on *any* make tractor you now own. Write today for complete information on this useful high-production tool.

LE ROI DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF CLEVELAND AIR TOOLS, TRACTAIR®, PORTABLE AND STATIONARY AIR COMPRESSORS, AND HEAVY-DUTY INDUSTRIAL ENGINES. WRITE US FOR INFORMATION ON ANY OF THESE PRODUCTS.

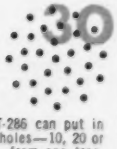


production:

6.

With its double drills, the T-286 can put down twice the footage of any air-driven wagon drill; handles holes up to 2¾ inch and depths to 24 ft.

7.



The T-286 can put in many holes—10, 20 or 30 — from one tractor setting. Wasteful moving and set-up time is eliminated.

The air-driven wagon drill puts down one hole per setting — must be repositioned for each hole.

utility:

8.

The T-286 has multiple uses—can do odd jobs, towing, cleanup work when drilling job is completed.

The air-driven wagon drill has only one use — is a dead investment when not drilling.

manpower:

9.

The T-286 needs two men—but both of them spend most of their time drilling—making hole—producing.

It also takes two men to operate the air-driven wagon drill, but only one is on the drill—the other must drive and position.

How about it?

Can you afford to tie your money up in a low-production, one-use tool—when for slightly more you can get double production plus high quality?

Bethlehem Hollow drills rock at site of Priest Rapids Dam on Columbia River. *General Contractor:* Merritt-Chapman & Scott Corporation, New York; *Consulting Engineers:* Harza Engineering Co., Chicago.

HARNESSING THE COLUMBIA RIVER AT PRIEST RAPIDS, WASHINGTON

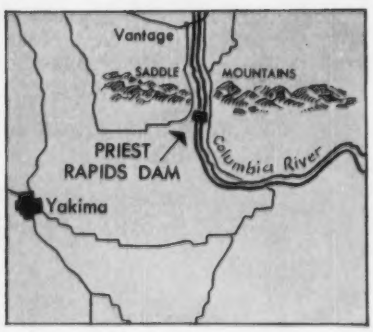
In the picture above, drilling crews are using Bethlehem Hollow Drill Steel in rock removal at the site of Priest Rapids Dam, on the Columbia River, about 24 miles below Vantage, Wash.

The new dam is the first phase of the new Columbia River development, and is being constructed for Grant County Public Utility District. It will be a concrete and earthen structure 8412 ft long, and will have a maximum height of 178 ft. Its eight generators will have a total capacity of 630,000 kw—one of the largest sources of hydroelectric power in the United States.

Bethlehem Hollow Drill Steel is economical in all kinds of rock drilling jobs because it is rolled from fatigue-resistant steel, and has a uniform hole which is centrally located in the bar. Bethlehem Hollow also has a wide quenching range. It is easy steel to heat-treat for the proper balance of toughness and wear-resistance, making possible long-wearing threads and strong shanks.

Bethlehem Hollow is furnished in Carbon and Ultra-Alloy grades in rounds, hexagons and quarter-octagons.

Be sure to specify Bethlehem Hollow for your next rock drilling job.



BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM HOLLOW DRILL STEEL

Carbon and Ultra-Alloy

BETHLEHEM STEEL

½ DAY LOST IN 8 YEARS

Since he switched to a "Jimmy" Diesel

Working up to 9 hours a day, 6 days a week, in Robert Bailey's strip mine near Morrisdale, Pa., this General Motors Detroit Diesel-powered shovel has had total down-time of only *one-half working day in 8 years' operation.* Because of the dependable service and economy of this "6-71" engine, Bailey swung to GM Detroit Diesel power—now operates 9 units on generators, in tractors and in another shovel.

Does it pay to standardize on GM Detroit Diesel power? It sure does. For it simplifies your servicing and parts requirements. And, with power at *every* piston downstroke, these fast-stepping 2-cycle Diesels get more work done at less cost on any job.

You can have GM Detroit Diesel power (single engines, 30 to 300 h.p.; multiple units, up to 893 h.p.) in over 1,485 different applications of power machinery. For the list, see your GM Detroit Diesel distributor or dealer—or write us direct.

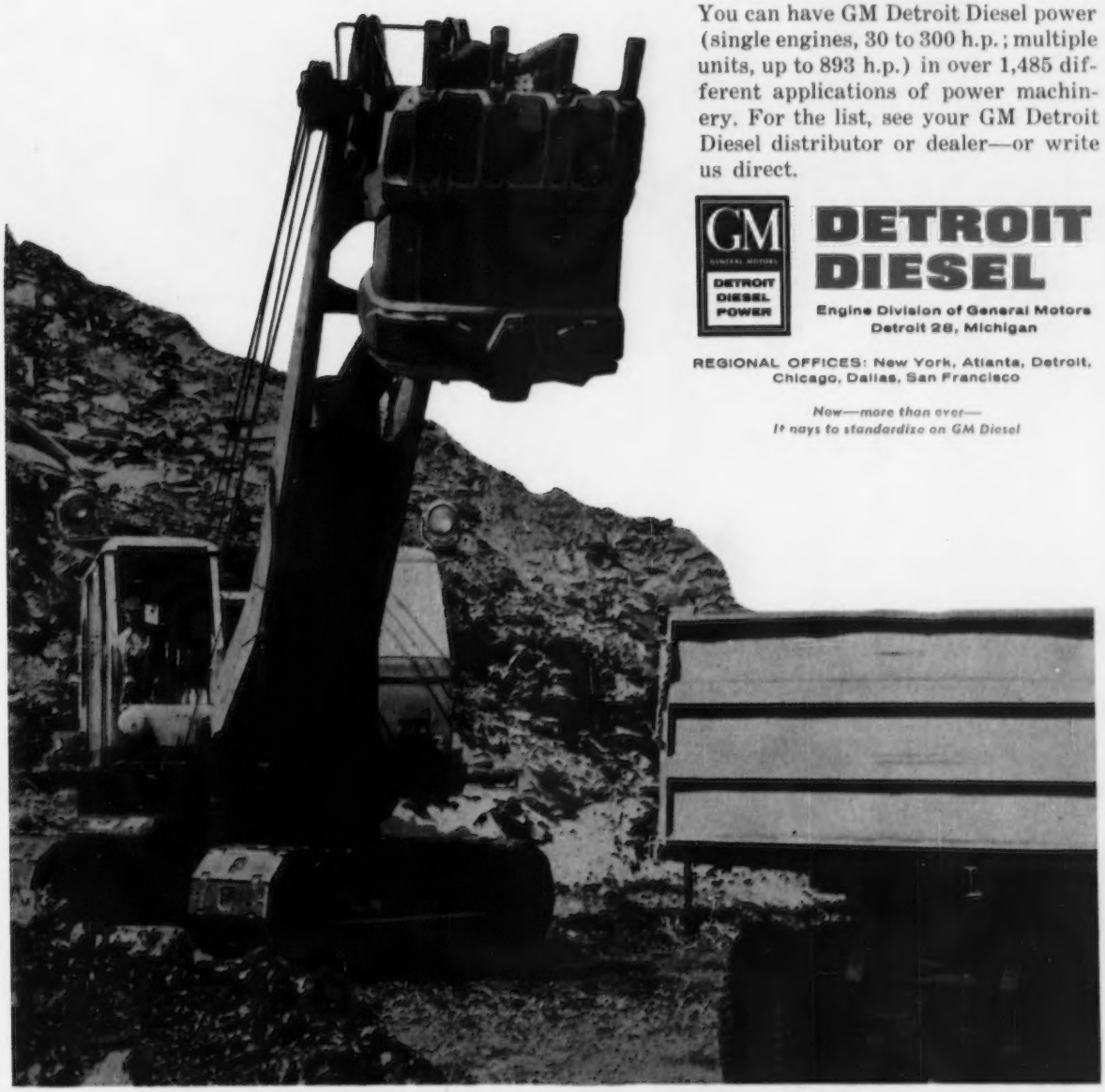
GM DETROIT DIESEL POWER

DETROIT DIESEL

Engine Division of General Motors
Detroit 28, Michigan

REGIONAL OFFICES: New York, Atlanta, Detroit, Chicago, Dallas, San Francisco

Now—more than ever—
It pays to standardize on GM Diesel



A GM "6-71" Detroit Diesel powers 1½-yd. shovel for Robert Bailey, Morrisdale, Pa.

Queen of the big shovels

55-CU.-YD. DIPPER makes a bulldozer look small. The Tiger Brand Wire Rope is 2⅝" in diameter.

THE RIVER QUEEN, largest shovel ever built by Bucyrus Erie. Now operating in the River Queen mine near Central City, Kentucky. The mine is owned jointly by W. G. Duncan Coal Co. and Peabody Coal Co. It is operated by Peabody.

can move 100,000 tons daily

with "muscles" of Tiger Brand Wire Rope

IN LESS THAN A MINUTE, the River Queen can scoop up an 80-ton bite of rock and earth, pile it 295 feet away and be ready for the next bite. That's fast digging!

The River Queen is the largest power shovel that Bucyrus Erie has ever built. It has a 55-cubic-yard dipper and is as high as a 13-story building.

The wire ropes that harness the tremendous power of the shovel are all U.S.S. American Tiger Brand. The two twin-reeved hoist ropes are 2⅝"-diameter, 6 x 49 Lang Lay Monitor Excellay with Independent Wire Rope Core. The two twin-reeved crowd ropes and the single twin-reeved backhaul rope are of the same size and construction.

The boom supports are eight in number for a total length of approximately 952 feet. These are 2½" Galvanized Boom Support Strands of special design for long service life.

The fact that all the wire rope applications on this huge shovel are handled by standard Tiger Brand constructions emphasizes the quality of the engineering that goes into the complete line of Tiger Brand Wire Rope.

THE BIG BOOM is 145 feet long and is supported by eight 2½" Tiger Brand Boom Supports. Note also the two twin-reeved hoist ropes in foreground.

AMERICAN STEEL & WIRE DIVISION
United States Steel, General Offices: Cleveland, Ohio

The right wire rope will do the trick!

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
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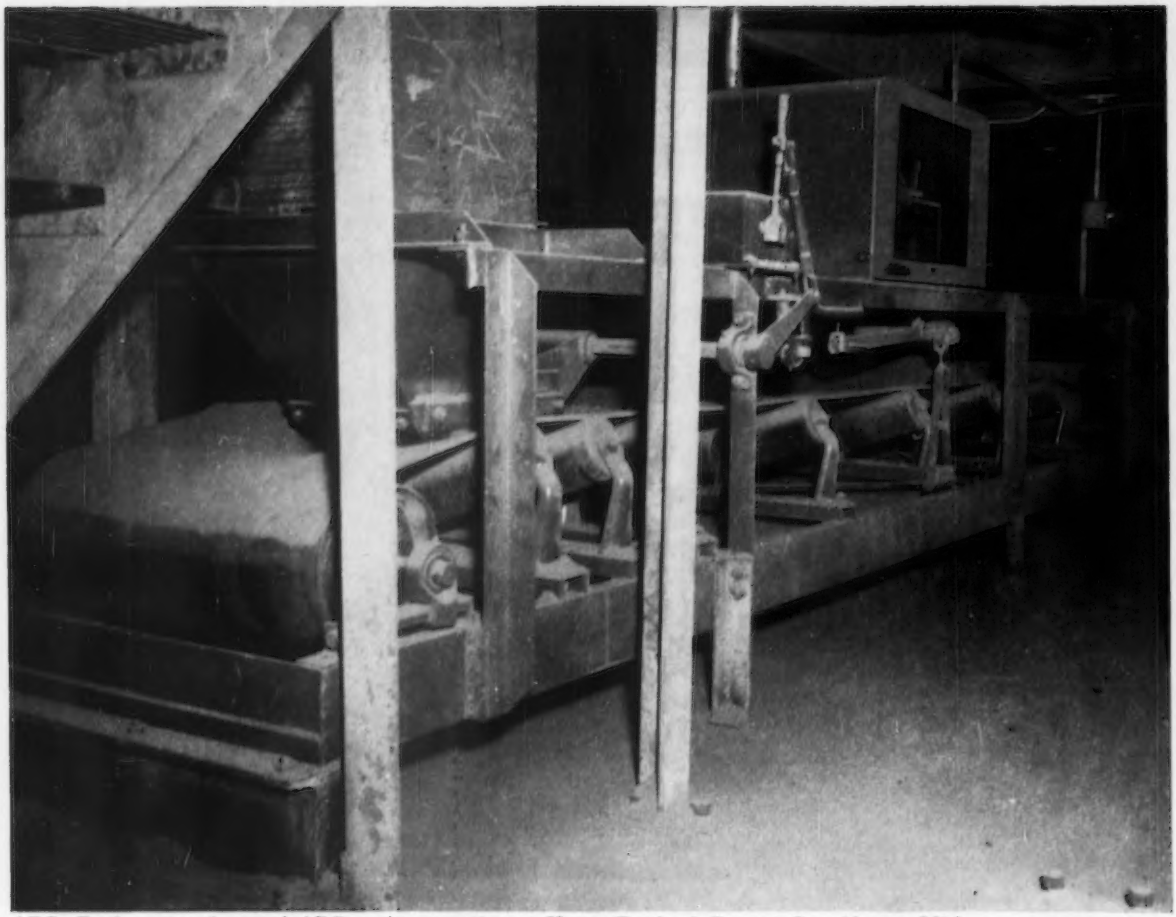
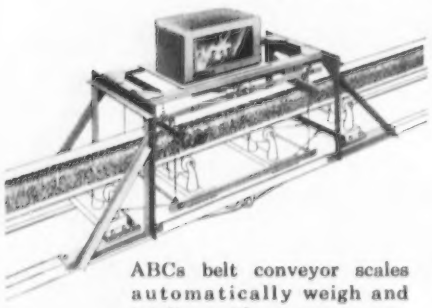
Excellay Preformed

UNITED STATES STEEL



ABCs Feeder, one of several ABCs units operating at Huron Portland Cement Co., Alpena, Mich.

Do you know the ABCs of automatic weighing and proportioning?



ABCs belt conveyor scales automatically weigh and totalize with accuracy warranted to ½ of 1%.

Accurate Blending Conveyor Scales and Feeders embody the basic elements of any automatic weighing and proportioning system for free flowing bulk materials — *plus* these extra benefits:

1. Easy to install, operate and maintain.
2. Continuous totalization.
3. Scales and Feeders may be used separately; or
4. Complete blending systems may be designed to suit individual requirements.

Accurate belt feeding and weighing means a better quality product.

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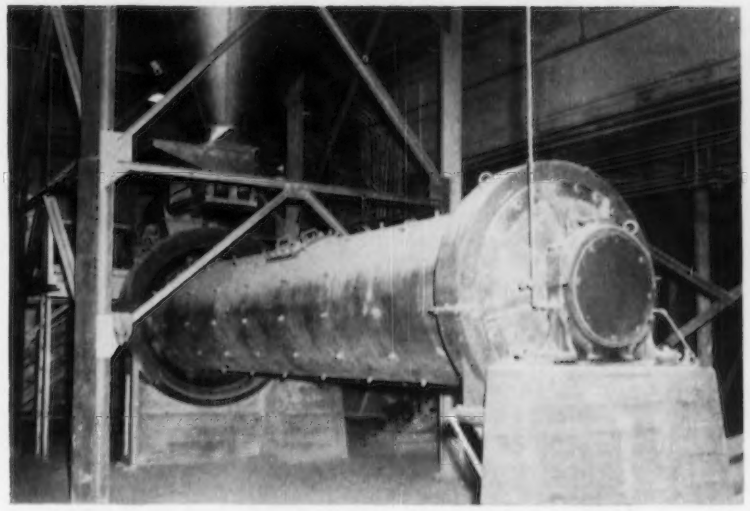
see what Marcy can do for YOU!

Custom-engineered Marcy Mills solve fine grinding problem for Kaiser Gypsum



Kaiser Gypsum Co., Inc., has wallboard and plaster manufacturing plants at Seattle, Washington; Antioch, California, and Long Beach, California. At all three plants Marcy Grate Discharge Ball-tube Mills operate 24 hours per day. These units include a 4½′ x 16′ mill at Seattle, two 4½′ x 20′ mills at Antioch, and 4½′ x 16′ and 4½′ x 20′ mills at Long Beach.

In manufacturing wallboard and plaster products, gypsum must be ground to an extremely fine product, to add plasticity to the end product and to control the aging of the plaster. Kaiser Gypsum solved this fine grinding problem by installing specially designed Marcy Grate Discharge Ball-tube Mills which include the additional feature of peripheral discharge.

High-temperature calcined gypsum is dry ground from approximately 100 mesh to a product between 2000 and 3000 Blaine. On occasions fineness of grind has been 5000 Blaine for special applications. This flexibility in fineness of grind, with most convenient means of control, is one of the important advantages derived from specialized Marcy engineering.

Solving this type of grinding problem is typical of Marcy engineering . . . you, too, can take advantage of this experience—just write, wire, or call.

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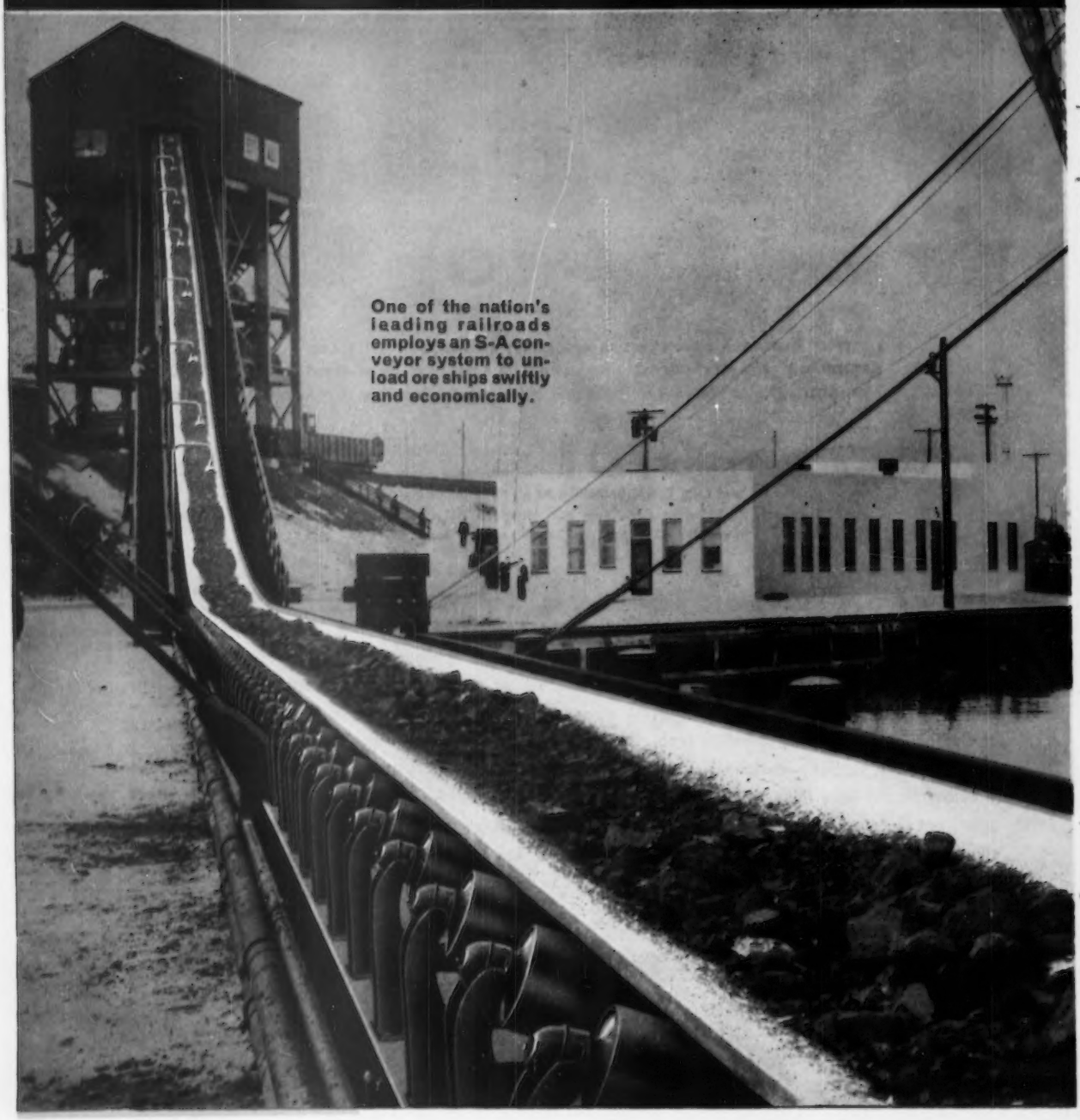

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wherever ore products ride first class!

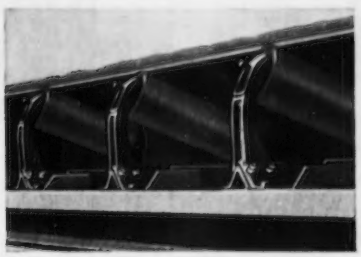
As lower grade ore is retrieved, ever greater tonnages will move over conveying systems with growing emphasis on economy. Conveyor operational cost—always an important factor, will call for the best engineering in new installations, and for closest examination of those systems already in operation.

To build a conveyor system that will carry your ore products first class at fourth class rates, requires the kind of experience always associated with the big name of STEPHENS-ADAMSON; experience gained in more than fifty years of manufacturing a complete line of conveying equipment—in the application and installation of this equipment.

Putting a big name conveyor system to work—an S-A system—costs no more. In fact, it will cost less in the long run in terms of maintenance, man power—in steady tonnage delivered.

See the S-A man in your area or contact any of the three S-A main office-plants direct.

All types of feeders are included in the S-A line to handle any tonnage and every kind of ore. AMSCO feeder shown here toughens with use—will absorb shock from any lumpy or abrasive ore.



S-A "anti-friction" carriers provide smooth rollers for belt conveyors, guarantee long life, lowest maintenance and power cost. A variety of carriers are manufactured to fit any belt conveyor assignment.

Engineered and built by S-A, a stacker boom delivers ore to a storage pile at high T.P.H. rate. Above or below ground, S-A engineers and builds the system specifically to meet the requirement.

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S-A manufactures a wide range of material handling products in three complete plants in U. S. and Canada.

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REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Conveyor Belt Cleaners
Headshaft Holdbacks
Grizzlies & Screens
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Bucket Elevators
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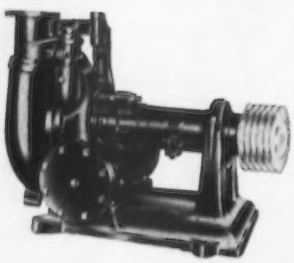
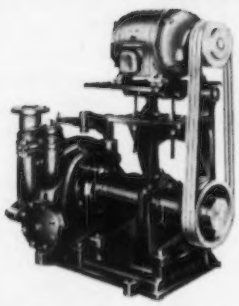
• *Write for a bulletin on any of the above.*

WILFLEY SAND PUMPS

LOW COST PUMPING



The new patented WILFLEY MODEL "K" centrifugal sand pumps are designed for maintained high efficiency in rugged service and trouble-free operation. They combine the original WILFLEY principles with new improvements developed through years of engineering experience.



BELT DRIVEN, overhead V-belt driven and direct driven WILFLEY Model "K" pumps available in 1", 1½", 2", 2½", 3", 4", 5", 6", and 8" discharge sizes with capacities to 3000 GPM and heads as high as 200'.

WILFLEY SAND PUMPS may be fitted with interchangeable electric furnace alloy iron or rubber covered wear parts to best meet the requirements of each pumping installation. The WILFLEY wear part design is ideal for rubber covering as ample clearance around the runner assures a practical and dependable rubber lined pump. Wherever you have a solids transfer job specify the WILFLEY Model "K" sand pump — for continuous, trouble-free performance, simple installation and stepped-up production.

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"Companions in Economical Operation"
Wilfley Acid Pumps

ENGINEERING AND MINING JOURNAL

OCTOBER 1957

The Mining Industry Airs Its Plights

SEPTEMBER was a month of soul-searching for the domestic mining industry. In Salt Lake City, able spokesmen of the American Mining Congress explored the plight of mineral commodities from A to Z. There we learned that the U.S. strategic minerals industry is all but shattered, the lead-zinc industry is reeling from a "flood of imports," and that copper is temporarily over-produced and under-priced.

But all was not sackcloth and ashes. Uranium, under Uncle Sam's protective umbrella, foresees at least a decade of prosperity. Aluminum producers plan to double capacity during the next ten years, and the steel industry looks to exciting new mineral processing techniques, such as the direct reduction of iron ores, to supply an ever-expanding population with steel at economic prices.

Naturally, some of this plight-probing called for remedial action. Metal and mineral imports were prime targets. The convention passed a resolution proclaiming, "It is the responsibility of our Government to see that foreign minerals and products fabricated from them are not permitted to flow unrestricted across our borders to stifle home industry and engender an economic revolution, which could well be second only to the political revolution which has encompassed so much of the world today."

But all sentiment was not expressed in the form of resolutions. Senator Alan Bible, who can be relied upon for practical suggestions, advised the mining industry to unite and present "a permanent long-range program for the entire mining industry instead of stop-gap measures aimed at helping one particular segment of the industry."

In a convention interview, Sen. Bible placed the responsibility for excessive imports at the door of a segment of U.S. companies when he asked, "How long will they continue to produce for the world market cheaply mined ores from their own holdings? I believe this segment of the U.S. mine industry has an obligation to curtail its production of foreign mined minerals, when our own American mining industry is jeopardized from the production of these minerals." We read out of this provocative statement a rather direct inference that many problems of the mineral industry could be solved without import controls, quotas, etc., if producers all over the world would pay more attention to demand for minerals, and moderate production to conform with consumption.

In fact, the whole tenor of the AMC meeting indicated that mining will have to depend more upon itself to solve its plights and less upon Government props and protection. V. E. Cooley, deputy director, Office of Defense Mobilization, made it quite clear at Salt Lake City that stockpile requirements are nearly filled.

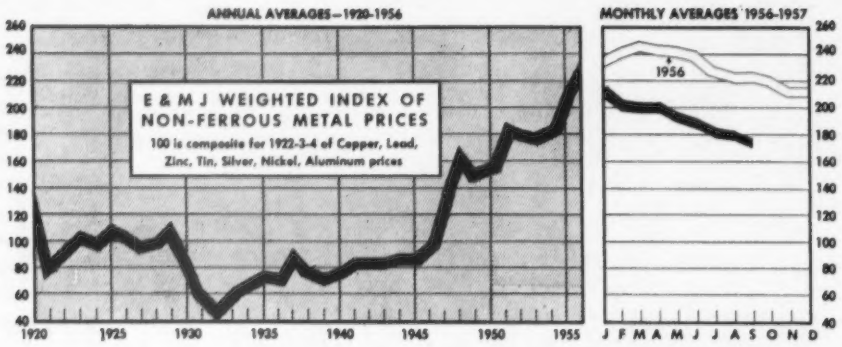
Certainly domestic tungsten producers learned that Congress is capable of committing a "breach of faith" by encouraging production of strategic materials and then cutting off the necessary support funds. Titanium producers who were urged to step up metal production as recently as early 1957 are learning how fast the Government can reverse its support. Even the aluminum producers who expanded production in response to Government appeals during the Korean emergency encountered at least a little reneging when it became necessary for the Government to honor its "put" agreements.

Stockpile purchases of lead and zinc now prove to have been a narcotic rather than a stimulant to the industry—and after the needle was withdrawn the over-production hangover set in.

So the whole situation boils down to this—primary producers will have to do more than produce—they will have to promote markets for their metals as well, just as the aluminum industry is doing. No matter how big your orebody may be, without a market you do not have a mine. This is just as true of antimony as it is of zinc.

E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES—1920-1956
MONTHLY AVERAGES 1956-1957
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
1956
1920 1925 1930 1935 1940 1945 1950 1955
J F M A M J J A S O N D

MARKETS

E&MJ's metal price index dropped about four units during September, approaching the level that prevailed before the climb to a record peak in 1955.

Careful documentation of the plight of the domestic lead-zinc industry in the past may speed action at pending Tariff Commission hearings. Early imposition of a tariff is expected to stimulate a fast flow of lead and zinc to the U. S. by foreign producers seeking to get in under the wire.

●

AT HOME

New Park Mining Co. shut down its Mayflower operations in late September. W. H. H. Cranmer, president, doesn't foresee any chances of resuming production until next year, and then only if the Federal Government will give some aid to domestic miners.

Reynolds Metals Co.'s contract to supply Esso Standard Oil Co. with 35 to 60-million quart-size aluminum oil cans represents a major breakthrough of the aluminum industry in the multi-million-dollar can field.

Fremont Minerals, Inc., says it has reached "a technical agreement" with AEC for a 750-ton uranium processing mill at Riverton, Wyo.

Ore reserves at the Radon and Hot Rock orebodies in Utah are now estimated at 500,000 tons, averaging 0.67% U_3O_8, according to Hecla Mining Co. Eight-month's production in 1957 totalled 36,698 tons, 0.815% U_3O_8.

Metal use per car in the three 1957 low-priced makes at Detroit runs about: 78 lb aluminum; 16 lb zinc; 45 lb copper, brass and bronze; and 28 lb lead.

National Industrial Conference Board reports "At least for the manufacturing sector of the country, the investment boom of the first postwar decade is slowly but steadily topping out."

Recognition of the speed and devastation of nuclear warfare is nullifying importance which early planners attached to large strategic stockpiles.

●

LABOR

Domestic mines have suffered more than 8,000 layoffs since April because of poor demand for copper, lead and zinc. As a result, Mine-Mill is swinging union lobbying tactics toward price supports and import controls. See p 127.

●

ABROAD

Sir Ronald Prain, chairman of Rhodesian Selection Trust, told interviewers in September that despite the short-term confused outlook for copper, his firm believes that copper has a fine future, and that it is not at all concerned about the long-term view. The company is going ahead with its $48-million expansion scheme at Mufulira. Sir Ronald recommended voluntary cutbacks by leading copper producers all over the world to remedy the present oversupply of metal. He estimated that a 10% cutback would steady today's markets without creating any serious unemployment problems.

International Finance Corp. is making a $2.2-million investment in a copper mine and smelter to be developed in the Antofagasta region of Chile by Empresa Minera de Mantos Blancos.

MARKETS

Copper Prices Drop; Rise in Lead-Zinc Tariff Likely; RST May Change System

NONFERROUS METAL PRICES CONTINUED THEIR DROP in September. The *E&MJ* weighted index of nonferrous metal prices dropped to 177.56% of the 1922-1924 average from 182.59 for August. This month the drop results from lower copper (down about 1½¢) and tin prices.

Tariff increases for lead and zinc through the regular U. S. Tariff Commission procedure were asked late in September by the Emergency Lead-Zinc Committee directed by Charles E. Schwab. The following table, in cents per lb of contained metal, shows the history of lead and zinc tariffs in the U. S. The Tariff Act of 1930 rates are under A, the Jan. 1, 1945 rates are under B, the current rates are under C, and the rates recommended by the Tariff Commission in April 1954 are under D.

	A	B	C	D
Lead				
Ores	1.5	1.2	0.75	1.8
Metal	2⅛	1.7	1 1/16	2.55
Zinc				
Ores	1.5	1.2	0.6	1.8
Metal	1.75	1.4	0.7	2.1

The rates under D are 50% above those under B. This is the maximum that may be obtained through this nonlegislative procedure. It is probably the amount the Commission will recommend to the President. It is above the Smoot-Hawley Tariff Act of 1930 rates.

There will be opposition. The increases will further reduce the already sharply fallen revenue of certain countries that buy manufactured goods from the U. S.—they will therefore buy even less from the U. S. unless they get increased loans or gifts. Peru, Mexico, Canada and Australia have already indicated their objections. They may retaliate by higher duties on U. S. goods and divert more of their buying to Germany, the U. K. and other countries. Export organizations and others in the U. S. whose income is partly dependent on exports will doubtless object to higher tariffs. They may say that for every dollar U. S. imports decrease, foreign dollar earnings will drop a dollar and therefore foreign purchases from the U. S. will decrease by an equal amount (unless we give or lend them more dollars). If they raise their duties against U. S. goods, exporters may claim U. S. exports will drop by more than the decrease in imports of metal and ore—so the U. S. national income would drop owing to the increased tariffs.

Groups seeking better international relations, importers of ores and metals, and consumers opposed to paying higher prices will object to the higher U. S. duties. Tariff raises are sometimes described as devices by which Government re-apportions a declining income in accordance with relative political pressures. The objectors are not well organized and their positions do not have much political appeal. The tariff hikes will probably go through early next year. The Lead-Zinc Committee asked for prompt hearings on the tariff and also said import quotas will be sought. The law permits quotas and the committee is expected to tie its quotas request to prices.

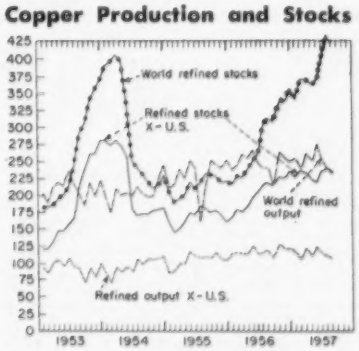
Copper prices moved about in Europe in September but ended the month about 1½c lower than at the beginning. London prompt bid was about 23.6c Sept. 30. RST remained at £200, about 24.85c —many analysts feel if London remains near £190, RST will have to drop. London hit a low of £182 Sept. 9, rose to £201½ the 16th, and dropped back to £190½ the 30th—there were some reversals in this drop, too. These drastic changes reflect the fact the London market involves so little copper that small rumors, a little more buying or selling, financial and exchange rate speculation, can turn the market about sharply.

RST dropped to £200 on Sept. 5; on Sept. 9 it went to £190, and on Sept. 16 it was again at £200. Katanga dropped to 24.5c Europe and the U. S. Sept. 10; it raised to 25.45c Sept. 14. Strengthening factors have been some producer buying in London, rumors of Kennecott output cuts (it laid off 125 workers in Nevada and shut down for two weeks at Chino for repairs), the British Board of Trade recall of its 27,000-ton sell decision, rumors of a devaluation of the pound sterling and a revaluation of the mark. But there was no solid information of a rise in demand by fabricators' customers nor of a sharp reduction in output.

It appears probable RST will abandon its flat price policy and use the LME for pricing.

Shipments of fabricated products by U. S. fabricators averaged about 109,000 tons the first eight months of 1957. For the total period of falling prices, Apr. 1956 to Aug. 1957, it was 110,000. During the period of rising copper prices, Sept. 1955 through Mar. 1956, the average was about 126,000 tons. Copper fabricators' stocks are exceptionally high, but most analysts say they are now held mainly by the large producers' subsidiaries. August producer statistics looked better. Though world refined deliveries were not good by standards earlier in the year, they were almost as high as the reduced refined production figures. Shipments of about 6,180 tons to non-consumers cut stocks by about 6,000 tons. But many observers believe fabricator and producer stocks are too high for a price turn-around. At best, they expect a smoothing out at about 24c in Europe; what kind of "premiums" the U. S. will support is uncertain, but some think the 27c producer price could hold with smelters about 1c or 1½c under.

Copper Production and Stocks



Data are from the Copper Institute and are in thousands of short tons. They include August 1957. The two series "X-U. S." are the world producer statistics less the U. S. No fabricator stocks are included.

Shipments to the U. S. Government will be a little higher in October and possibly in September as San Manuel and perhaps White Pine copper go to Government under expansion contracts (some of the latter had been going under flat price contracts which have terminated).

Aluminum markets are unchanged. Kaiser and Alcoa agreed to deduct from the amounts they could "put" to the Government their total imports; they both have firm contracts to import from Alcan. This can cost the two about $100-million; it will probably cost Alcoa more of this than Kaiser (Reynolds has no import contracts). But the U. S. Government's Comptroller-General ruled the companies did not have to deduct it—GSA was obligated to take all the "puts" even if the companies did import. So why the companies gave in is a mystery. But the "put" aluminum goes into the DPA inventory and can be sold on the market by the Government without Congressional or Presidential approval—some think this is the answer.

Alcan's Arvida strike ended with a loss of about 125,000 tons. It will now operate at only 75% of capacity—about 306,000 tons per year.

Lead prices were steady in September. Shipments to industry rose by about 11,000 over July. Sales in September are less than in August, but good August sales may mean good September shipments. The Government took 6,161 tons, a little better than in July. Lead from abroad is sold in the U. S. about ½c under the domestic lead price.

Zinc figures for the U. S. in August show little change. Shipments to industry were about 3,000 tons under output; the Government took 9,871 tons. Imported Special High zinc sells for 11c N. Y. docks; the U. S. delivered price is 11.75c. Special High grade shipments in August were 29,807 tons, the best since March.

Tin prices ended the month a fraction of a cent higher than the end of August. Demand is still slow. Some temporary strength during the month probably reflected fears of Sterling devaluation.

MARKETS (*Continued*)

Average Prices Sept. (E&MJ Quotations)

Copper:	
Electrolytic, domestic refinery	26.435
Electrolytic, export refinery	23.926
Lead:	
Common, New York	14.000
Common, St. Louis	13.800
Silver and sterling exchange:	
Silver, New York, per oz.	90.602
Silver, London, pence per oz.	78.720
Sterling Exchange	278.509
Zinc:	
Prime Western, East St. Louis	10.000
Prime, Western, delivered (g)	10.500
Tin:	
New York Straits	93.385
Gold per oz. U. S. price	$35.000
Quicksilver, per flask	$244.750
Antimony, (E&MJ)(d)	36,590
Antimony, bulk, Laredo	33.000
Antimony, in cases, Laredo	33.500
Platinum, refined, per oz.	$84.000
Cadmium (a)	170.000
Cadmium (b)	170.000
Cadmium (c)	170.000
Aluminum, 99% plus ingot	28.100
Magnesium, ingot	35.250
Nickel (f)	74.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lb.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lots, packed in case f.o.b. New York.

(f) Contract price, f.o.b. Port Colborne, U.S. duty included. Other regular sellers 78¾¢ to $1.25.

(g) Delivered where freight exceeds 0.5¢.

"Free" Gold Market

Transactions declined 15% during the month. Bar gold and coin prices varied only slightly. No Soviet gold sales were reported from Europe. Continental dealings again showed Paris with largest turn-overs. Western Hemisphere markets were quiet with Argentina listing gold at a historic high. Mexico showed the world's lowest gold price, $34.55 per oz. Asiatic centers were active. Gold smuggling into India and satellite countries increased in volume. Pick's World Currency Report quotes on "free gold" per fine oz, as follows:

	COINS		BARS (12.5 kg)	
	Aug. 31	Sept. 30	Aug. 31	Sept. 30
NEW YORK, transit	.....	.....	$35.09	$35.09
MANILA	$44.00	$44.25	36.40	36.45
HONG KONG	45.00	45.75	38.15	38.45
BOMBAY	57.25	57.25	56.00	56.25
TANGIER	43.50	42.75	35.20	35.20
BEIRUT	43.10	43.50	35.10	35.10
PARIS	44.50	44.25	36.35	36.35
BUENOS AIRES	39.25	39.00	35.65	36.10

Note: Prices are quoted at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Sept. 1957	Electrolytic Copper (a) Domestic	(b) Export	Lead New York	Lead St. Louis	Zinc (f) Delivered	Zinc East St. Louis	Aluminum Primary Pig 99%	Straits Tin New York
2	Holiday	24.450			Holiday			
3	26.575	24.825	14.000	13.800	10.500	10.000	26.000	92.875
4	26.575	25.175	14.000	13.800	10.500	10.000	26.000	92.875
5	26.475	24.225	14.000	13.800	10.500	10.000	26.000	92.750
6	26.600	24.125	14.000	13.800	10.500	10.000	26.000	92.750
7	No Market	24.125	14.000	13.800	10.500	10.000	26.000	92.750
9	26.475	23.275	14.000	13.800	10.500	10.000	26.000	93.000
10	26.350	22.875	14.000	13.800	10.500	10.000	26.000	93.000
11	26.375	23.475	14.000	13.800	10.500	10.000	26.000	93.000
12	25.425	23.150	14.000	13.800	10.500	10.000	26.000	93.250
13	26.050	23.600	14.000	13.800	10.500	10.000	26.000	93.500
14	No Market	23.600	14.000	13.800	10.500	10.000	26.000	93.500
16	26.400	24.300	14.000	13.800	10.500	10.000	26.000	93.875
17	26.575	23.875	14.000	13.800	10.500	10.000	26.000	93.750
18	26.550	23.900	14.000	13.800	10.500	10.000	26.000	94.125
19	26.525	24.075	14.000	13.800	10.500	10.000	26.000	93.625
20	26.525	24.225	14.000	13.800	10.500	10.000	26.000	93.625
21	No Market	24.225	14.000	13.800	10.500	10.000	26.000	93.625
23	26.525	24.025	14.000	13.800	10.500	10.000	26.000	93.625
24	26.475	23.900	14.000	13.800	10.500	10.000	26.000	93.500
25	26.550	23.650	14.000	13.800	10.500	10.000	26.000	93.500
26	26.550	23.450	14.000	13.800	10.500	10.000	26.000	93.625
27	26.600	23.825	14.000	13.800	10.500	10.000	26.000	93.875
28	No Market	23.825	14.000	13.800	10.500	10.000	26.000	93.875
30	26.525	23.975	14.000	13.800	10.500	10.000	26.000	93.375
AVERAGES FOR MONTH								
Sept.	26.435	23.926	14.000	13.800	10.500	10.000	26.000	93.385
AVERAGES FOR WEEK								
Sept.								
4	27.225	24.763	14.000	13.800	10.500	10.000	26.000	92.975
11	26.455	23.683	14.000	13.800	10.500	10.000	26.000	92.875
18	26.200	23.738	14.000	13.800	10.500	10.000	26.000	93.667
25	26.520	24.017	14.000	13.800	10.500	10.000	26.000	93.583
CALENDAR WEEK AVERAGES								
Sept.								
7	26.556	24.488	14.000	13.800	10.500	10.000	26.000	92.800
14	26.135	23.329	14.000	13.800	10.500	10.000	26.000	93.208
21	26.515	24.100	14.000	13.800	10.500	10.000	26.000	93.771
28	26.540	23.779	14.000	13.800	10.500	10.000	26.000	93.667

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Sept. 1957	Silver (c) New York	Silver London	Sterling Exchange	Gold London	Gold (d) United States
2	Holiday	78.625d.	Holiday	251s. 3½d.	Holiday
3	90.625	78.625d.	278.2312	251s. 2½d.	$35.00
4	90.625	78.625d.	278.2625	251s. 2½d.	35.00
5	90.625	78.625d.	278.2500	251s. 2½d.	35.00
6	90.625	78.625d.	278.2187	251s. 2¼d.	35.00
7	(e)	(e)	(e)	(e)	35.00
9	90.625	78.750d.	278.2812	251s. 2¼d.	35.00
10	90.625	78.750d.	278.2687	251s. 2½d.	35.00
11	90.625	78.750d.	278.2687	251s. 3¼d.	35.00
12	90.625	78.750d.	278.2500	251s. 3¾d.	35.00
13	90.160	78.750d.	278.2500	251s. 3½d.	35.00
14	(e)	(e)	(e)	(e)	35.00
16	90.625	78.750d.	278.2812	251s. 3¾d.	35.00
17	90.625	78.750d.	278.3375	251s. 3¼d.	35.00
18	90.625	78.750d.	278.2500	251s. 2¾d.	35.00
19	90.625	78.750d.	278.2500	251s. 2¾d.	35.00
20	90.625	78.750d.	278.3125	251s. 2¼d.	35.00
21	(e)	(e)	(e)	(e)	35.00
23	90.625	78.750d.	278.7500	250s. 11¼d.	35.00
24	90.625	78.750d.	279.2343	250s. 5½d.	35.00
25	90.625	78.750d.	278.9140	250s. 3¾d.	35.00
26	90.625	78.750d.	278.8812	250s. 5½d.	35.00
27	90.625	78.750d.	279.1562	250s. 6¼d.	35.00
28	(e)	(e)	(e)	(e)	35.00
30	90.625	78.750d.	279.5312	250s. 3½d.	35.00
AVERAGES FOR MONTH					
Sept.	90.602	78.720d.	278.509	—	35.00
AVERAGES FOR WEEK					
Sept.					
4	90.625	—	278.241	—	35.00
11	90.625	—	278.257	—	35.00
18	90.532	—	278.274	—	35.00
25	90.625	—	278.692	—	35.00

Calendar Week Averages: New York Silver: Sept. 7th, 90.625; 14th, 90.532; 21st, 90.625; 28th, 90.625.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.400c per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.125c for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingots; cathodes are sold at a discount of 0.125c to 0.15c per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East, Middle West, and West effective Jan. 1, 1951, commanded a premium of 1.35c per pound over the current market for Prime Western; Special High Grade 1.75c effective Dec. 1, 1955.

(f) Prime Western delivered where freight from E. St. Louis exceeds one-half cent.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 pounds.

(c) The daily silver quotation reported by Handy & Harman, in cents and fractions of a cent per troy ounce, is the price paid by Handy & Harman in settlement for silver contained in unrefined silver-bearing materials submitted to them for refining. It is determined on the basis of offers of bar silver .999 fine as made to Handy & Harman for nearby delivery at New York by regular suppliers in quantities sufficient to meet daily requirements, and it is usually one quarter cent below the price at which such offers are made.

The Treasury's purchase price of newly mined domestic silver is 90.5 per troy ounce 1000 fine effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

London Metal Exchange Quotations

Sept.	COPPER Cash Bid	COPPER Cash Asked	COPPER 3 Mo. Bid	COPPER 3 Mo. Asked	LEAD Current Month Bid	LEAD Current Month Asked	LEAD 3 Mo. Bid	LEAD 3 Mo. Asked	ZINC Current Month Bid	ZINC Current Month Asked	ZINC 3 Mo. Bid	ZINC 3 Mo. Asked	TIN Cash Bid	TIN Cash Asked	TIN 3 Mo. Bid	TIN 3 Mo. Asked
2	202	202¼	205	205¼	90½	90¾	90¾	91	73	73¼	73	73¼	735	735½	736½	737
3	199¼	199¾	202½	202¾	90	90½	90¼	90½	72½	72¾	72½	72¾	734½	735½	736½	737
4	197¾	198	200½	201	90¼	90¾	90¼	90½	73¼	73½	72¾	73	735½	736	737	737½
5	195½	195¾	198¼	198½	90¼	90⅝	90¼	90½	72⅝	72⅞	72½	72¾	735	735½	737	737½
6	191¾	192	194¾	195	90¼	90½	90½	90⅝	73	73⅛	72⅞	73	735	735½	737	738
9	182	183	185½	186	90	90⅛	90¼	90½	73	73⅛	73	73⅛	735½	736	737	737½
10	188	188½	190½	191	90¼	90¼	90⅜	90½	73⅛	73⅜	73⅛	73⅜	736½	737	737½	738
11	187¼	187½	190¼	190½	90	90⅛	90¼	90½	73⅛	74	73½	73¾	736½	737	737½	738
12	191	191½	194	194½	89¾	90	90⅝	90⅝	74	74¼	74	74¼	737½	738	737½	738
13	198½	199	201	202	89¾	90	90¾	91	74¼	75	75½	75¾	738½	739	738½	739
16	201½	202	205	205½	91	91½	91¾	92	76½	76¾	76½	76¾	742	742½	742	742½
17	192½	192¾	195½	196	90¼	90½	91	91¼	74¼	74⅝	74½	74¾	741	742	741	741½
18	198	198½	201½	202	89½	89¾	90	90¼	72¾	73	73¼	73½	743½	744	743½	744
19	196½	197	201½	202	89¼	89¾	90¼	90½	73	73¼	73¼	73½	743½	744	744	744½
20	196	196½	200½	201	89½	89¾	90¼	90½	72¾	73	73¼	73½	744	745	744	745
23	193½	194	197½	198	89	89¼	90	90¼	72	72¼	72½	72¾	743	743½	743½	744
24	190½	191	194	194½	88⅝	88½	89⅝	89½	71½	71¾	72	72¼	739	739½	739½	740
25	191	191½	194	195	88¾	89¼	89¾	90	71½	71¾	72¼	72½	739½	740	739½	740
26	191½	192	195	195½	89	89¼	90	90¼	71⅝	71⅞	72½	72⅝	740½	741	740	740½
27	193	194	196½	197	89¼	90	90½	90¾	72¼	72½	73	73¼	750	752½	743	743½
30	190½	191	194	194½	88¾	89	90¼	90⅝	70¾	71	72¼	72½	740	742	739	739½
Av'g's	£193.935		£197.256		£89.836		£90.455		£73.086		£73.372		£739.679		£739.845	

Prices are for the official a.m. session in pounds sterling per ton of 2240 lb. Copper basis wire bars, lead 99.97%, zinc 98¾ and tin min. 99.75%.

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated, tons of 2,000 lb. unless otherwise noted. St—short ton; lt—long ton.

MISCELLANEOUS METALS

September 30, 1957

Aluminum ingot, 99⁺plus % lb.			28.1¢
Antimony, spot, lb. less than carload, in cases			36.59¢
In bulk, carload lots, f.o.b. Laredo			33.00¢
Bismuth, ton lots, lb.			$2.25
Cadmium, commercial sticks, delivered, lb.			$1.70
Calcium, lb. ton lots, 98%, cast			$2.05
Chromium, 97% grade, lb. contract del.			$1.29
Cobalt, 97 to 99%, per lb. eff. Feb. 1, 1957			$2.00
Germanium, per gram, 10,000 gram lots	(c)38¢	@ (d)45½¢	
Indium, troy oz.			$2.25
Lithium, lb. 98%	$11.00	@ $14.00	
Nickel, cathodes, lb. (a)			74¢
Other sales, reg. sellers	80¢	@ 85¢	
Sales by dealers, etc.	80¢	@ 85¢	
Magnesium, 99.8% carloads, lb. producer's plants, Velasco, Texas, eff. Apr. 16			35¼¢
Palladium, troy oz.	$21.00	@ $22.50	
Platinum (wholesale lots), troy oz.	$81	@ $87	
Quicksilver, flask of 76 lb., 25 flasks or more	$241	@ $244	
Selenium, 99 plus %, lb. (May 28, 1957)			$10.50
Silicon, minimum 97%, carloads, lb.			22¢
Semi-Conductor grade, lb.			$350
Tellurium, lb.			$1.65
Thallium, 100 lb. or more, lb.			$12.50
Titanium, 99.3 plus, grade A-1, max. 3% iron, lb.			(b)$2.25

(a) Eff. Dec. 6, 1956; incl. U. S. duty; (b) Effective June 3, 1957.
(c) Delivered; (d) f.o.b. plant

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per short ton unit	$36.00	@	$37.00
Chrome Ore per long ton, f.o.b. cars Atl. ports, dry:			
44% Cr_2O_3 no ratio	$30	@	$30.50
48% Cr_2O_3 3 to 1 ratio	$51	@	$57
Iron Ore, Lake Superior, Lower Lake ports, long ton:			
Old Range bessemer			$11.85(e)
Mesabi bessemer			$11.60(e)
Mesabi, non-bessemer			$11.45(e)
Lead (Galena), 80%, Joplin, Mo., ton			$170.52
Manganese Ore—Per long ton unit of Mn basis 48% manganese, nearby positions, subject to premiums and penalties, c.i.f. U. S. ports, import duty extra, export duty included, $1.40 @ $1.43; both duties excluded, $1.265 @ $1.295. Long-term contract nominal.			
Molybdenum Ore, 90%, per lb. of Mo f.o.b. mines	$1.18	@	$1.23
Columbium-Tantalum, per lb., combined oxides 10 to 1 ratio	$1.35	@	$1.40
Tungsten Ore, per unit of WO_3:			
Foreign 60%, c.i.f. U. S. ports, duty extra	$12.75	@	$14.25
U. S. mined concentrate, per stu, f.o.b. mill (GSA price) (Suspended)			$55
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines			31¢
Zinc Ore, Prime, 60% concentrate, Joplin, Mo., per ton			$56

(a) Nominal.
(e) Eff. 1957 shipping season.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered			5½¢
Cobalt Oxide, 72½% to 73½%, per lb. eff. Dec. 1, '56	$1.52	@	$1.55
Copper Sulphate, 100 lb. eff. Oct. 25, '56			$13.90
Germanium Oxide, gram			27½¢
Molybdic trioxide, technical, per lb of Mo	$1.38	@	$1.41

ALLOYS

Ferrochrome 65 to 70%, per lb. of Cr. (4-9% C)			28¾¢
Ferromanganese, 74 to 76%, per lb., shipg. pt.			12¼¢
Ferromolybdenum, 58 to 64% Mo, lb. of Mo contained	$1.68	@	$1.74
Ferrosilicon, 50% per lb. of Si f.o.b. shipping point (3-19-57)			14.20
Ferrotungsten, 72 to 82%, lb. of W contained			$2.15
Ferrovanadium, per lb. of V delivered	$3.20	@	$3.40
Silicomanganese, max. 1½% carbon, lb., contracts			12.8¢
Spiegeleisen, per long ton, 19 @ 21% grade eff. Jan. 7			$102.50

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:			
Crude No. 1	$1,400	@	$1,725
Crude No. 2	$750	@	$1,100
Spinning fibers	$350	@	$650
Shingle fibers	$190	@	$210
Paper stock	$114	@	$137
Waste	$82	@	$84
Shorts	$28	@	$75
Asbestos, f.o.b., Vancouver, B. C. (U. S. funds):			
Spinning fibers	$470	@	$750
Shingle fibers, effective Jan. 1	$210	@	$310
Asbestos, Vermont, f.o.b. Hyde Park:			
Spinning fibers	$353	@	$383
Shingle stock	$172	@	$190
Paper stock	$114	@	$145
Waste, stucco or plaster			$82
Refuse or Shorts	$39	@	$72
Barytes f.o.b. cars:			
Georgia, crude, per ton			$18
Missouri, 94% $BaSO_4$, per short ton	$16	@	$18
Crude oil well grade, min. 4.3% sp. gravity, st (a)			$18
Imported, c.i.f. Gulf Ports, st	$16	@	$18
Bauxite, long ton, f.o.b. point of shipment:			
Domestic, crude, 50 to 52% (not dried)	(c)$ 5.00	@	$5.50
Domestic, chemical, 55 to 58%	(c)$ 8.50	@	$9.05
Domestic, abrasive, 80 to 84%	(c)$18.00	@	$18.50
Imported metallurgical, per lt, f.o.b. Br. Guiana, dep. on grade			$7.14
Feldspar, bulk ton:			
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50	@	$22.50
Glass feldspar, white, 20 mesh	$11.75	@	$12.50
Fluorspar, f.o.b. mines, bulk, 72½% effective, ton	$33	@	$41
60% effective CaF_2	$30	@	$36.50
Acid 97% concentrate, bulk, ton (eff. 12-1-56)			$50.00
Some sellers quote			$55
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00	@	$14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington			$46
Mica—Domestic, f.o.b. mines. Punch 7¢ to 12¢ per lb. according to size and quality. Sheet clear, 1½ x 2-inch, 70¢ to $1.10; 2 x 2-inch, $1.10 to $1.60; 2 x 3-inch, $1.60 @ $2.10; 3 x 3-inch, $1.80 @ $2.30; 3 x 4-inch, $2.00 @ $2.60; 3 x 5-inch, $2.60 @ $3.00; 4 x 6-inch, $2.75 @ $4.00; 6 x 8-inch, $4.00 @ $8.00. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $25 and up.			
Ocher, Georgia, ton, in sacks	$26.50	@	$32.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports			Not quoted
Sulphur, per lt, f.o.b. U. S. mines: bright			$23.50
dark	$22.50	@	$23
Mexican, for use in Mexico, per metric ton, f.o.b. mines, 280 to 395 pesos, depending on use	$22.40	@	$31.60
For export f.o.b. vessel, dep. on grade	$24	@	$26
Talc, f.o.b. works, ton:			
New York, purified	$18.00	@	$20.00
Vermont, extra white			$12.50
Tripoli, Missouri, ton:			
40-mesh, cream colored			$50.00

(a) Some restricted sales at $11.50. (b) Corrected. (c) Nominal.

IRON AND STEEL

Pig Iron, gross ton, basic, Valley Furnaces			$66.00
Steel, f.o.b. Pittsburgh, billets, net ton			$77.50
Structural shapes, Pa., Ala., etc., 100 lb.	$5.10	@	$5.275

MRS. STEEN, left, surveys audience while Charlie bones up on speech. Next to him are his friends, E. H. Snyder board chairman who guided URC's formation; Jesse Johnson, dedicatory speaker, Mrs. Melich and Mitchell Melich, URC president.

BAND MUSIC WINDS UP the dedication while hundreds stroll over to refreshment counter for pop and hot dogs. Plant tours were arranged for all visitors.

W. R. McCORMACK, who grub-staked Steen, shows "beat-up" Mi Vida rig.

Uranium Reduction Co. Dedicates $9-Million Mill

DEDICATION OF Uranium Reduction Co.'s $9-million mill at Moab, Utah, on Sept. 14 marked a pinnacle in the career of Charles Steen, whose rise from ragged prospector to multimillionaire adds a colorful chapter to twentieth century mining history. Speaking as a veteran "still carrying the scars of a cold war" with bankers, lawyers, public officials, etc., during the stormy years which followed the Mi Vida bonanza discovery in 1952, Steen took the occasion to thank loyal friends and associates "who stood pat."

"Without Mitch Melich," Steen said, "there would be no Uranium Reduction mill." He described URC's president as a lawyer "who values principle and integrity above the dollar."

The guiding influence which E. H. Snyder, chairman of the board of directors, lent to the milling enterprise during the critical days of negotiation with the Atomic Energy Commission was acknowledged by both Steen and Melich who keynoted the dedicatory ceremonies.

Steen predicted that W. R. McCormack who grub-staked him as a prospector would stand out as a giant in uranium history. "A beat-up old rig" which Steen and McCormack used to discover the Mi Vida was on display at the ceremony.

Andy K. McGill, director of Utex Exploration, was cited as the Canadian Scotsman who started Charles Steen off on his career as a geologist.

W. T. Hudson, was described as a "charter member" of the group of associates who made a success out of the Mi Vida enterprise.

H. I. Young, president of American Zinc Lead & Smelting Co., and R. A. Young, executive vice president and director of URC, were credited with having given invaluable aid through a management contract under which American Zinc assumed responsibility of finances, construction and operation of the mill.

Dedicatory speakers including Steen, H. I. Young, Melich, and Snyder, joined in a hearty acknowledgement of Jesse C. Johnson's practical and business-like administration of the Division of Raw Materials of the AEC.

Steen praised Roy Hollis, mill manager, and his staff for the "wonderful job they did on teaching this baby (the new 1,750-ton mill) to walk." After an amazingly short break-in period, URC's mill started producing at over-capacity rate and has been so successful that the company has been able to pay off its loans ahead of schedule. This year the company expects to produce 540,000 tons of ore

valued at $19-million. To do this it will require $5-million worth of Utah products including 2,455 railroad tank cars of sulphuric acid, 9,025 tons of nitric acid and 1,825 tons of anhydrous ammonia. Annual payroll runs about $1,276,000. U_3O_8 output of the mill this year is expected to run 3.4-million pounds, valued at more than $25-million.

Mining Calendar

AIME and ASME Joint Solid Fuels Conference, Quebec City. Oct. 10-11

Society of Mining Engineers annual meeting and Southeastern States Mining Conference, AIME. Hotel Hillsboro and Hotel Tampa Terrace, Tampa Fla. Oct. 15-18

Professional Engineers of Oregon, state convention, Eugene, Ore. Oct. 18-19

45th Annual National Safety Congress and Exposition, Chicago, Ill. Oct. 21-25

International Atom Week, sponsored by Atomic Industrial Forum and American Nuclear Society, New York City, Oct. 18-Nov. 1

Rocky Mountain Minerals Conference, AIME, Denver, Colo. Oct. 30-Nov. 1

American Society for Metals, second world metallurgical congress, Chicago, Ill. Nov. 2-8

International Mining Days '57 and 1957 Annual Meeting of New Mexico Mining Association, El Paso, Texas. Nov. 7-9

Society of Exploration Geophysicists, 27th annual meeting, Dallas, Tex. Nov. 11-14

Institute of Metals, (London) inaugural meeting of powder metallurgy group. Church House, London. Dec. 4

Governor's Industrial Safety Conference (California). Eighth annual meeting. San Francisco, Feb. 6-7

AIME, annual meeting. Hotel Statler and Sheraton-McAlpin, New York. Feb. 16-20

Alcoa Options Piedmont Lands in South Carolina

Aluminum Company of America disclosed recently that it has acquired options on approximately 26,000 acres of land in the Spartanburg, S. C. area as part of its continuous search for alumina-bearing ores.

The acquisition of these options and the exploration work were conducted by Piedmont Properties Inc., a company organized by Alcoa for this purpose. According to Maurice Bennett, local manager for Piedmont, results to date cause considerable doubt as to whether there is a sufficient supply of usable material to warrant construction and operation of a commercial alumina plant. He said that even the best of these local ores that have been tested do not compare in alumina content with the bauxite ores commercially used today.

As We Went to Press . . .

Tariff Commission received the application of the Emergency Lead and Zinc Committee that the "escape clause" in foreign trade agreements be invoked and import duties be raised.

Committee requested an investigation and hearing on whether imports of the minerals under the reduced import duty rates established by trade agreements "are causing or threatening serious injury to the domestic lead and zinc industry."

Disposal of the Nicaro nickel plant by GSA is in the offing. Government offer to sell or lease the facility will be effected by a request for proposals from interested companies.

Included in the terms, GSA says, will be a provision guaranteeing a portion of output to the Federal Government in times of need. Reason for disposal of the plant at this time was increased sources of nickel and condition of the Government stockpile.

Canadian and U. S. sources say a firm composed of interests of Cyrus Eaton and Alfred Krupp may be organizing to tap the Ungava Bay iron ore sources and feed Germany's steel mills.

AEC has agreed to purchase concentrates from a $95-million mill to be built at Grants, N.M. by Phillips Petroleum Co. Negotiations for the 1,725-tpd uranium processing plant have been in progress for several months. It will handle Phillips ores from the Ambrosia Lake area and, presumably, some custom ores.

Construction is to begin at once and a company spokesman said production should be achieved by mid-1958. New plant joins the operating Anaconda plant at Bluewater and three others in the planning and construction stage: Homestake-New Mexico Partners, due next January; Homestake-Sapin, July 1958; and Kermac Nuclear, not yet under way.

USGS geologists, working with Brazil's Departmento Nacional da Producao Mineral, have announced detailed geologic mapping and technical appraisal of Congonhas district, Minas Gerais, and discovery of 20-billion tons of hematite.

Philip W. Guild, author of Survey Professional Paper 290, which covers 8% of the survey of the area, says 7.5-billion lies within 100 meters of the surface and could be mined by open pit. Average grade is believed to be about 40% iron.

The sudden death of Jeremiah D. Murphy, assistant secretary of Anaconda Co. saddened the vast number of co-workers and members of the mining industry who knew and admired him. Mr. Murphy, 69, was interred Sept. 23 at Butte.

More for HEF: Hooker Electrochemical Co., world's largest manufacturer of chlorates, and Foote Mineral Co., producer of lithium metal and Li salts, have begun joint exploration in the field of high energy fuels. Metal Hydrides has completed its construction of a $5-million sodium borohydride plant at Danvers, Mass.

Another headache for titanium, already suffering greatly from the squeeze of lowering defense and aircraft orders and the need for expensive research, is announcement by Armco Steel of an "easily fabricated stainless steel" which can handle aircraft speeds up to 2700 miles per hour.

Behind the By-Lines...

Lest there be any errant thought that a ceremony involving our irrepressible friend Charlie Steen could be too solemn, we reprint herewith one of the highlights of the dedication of the new Moab mill of Uranium Reduction Co. (p. 72).

If the photograph of degree-candidate Johnson and friend is not too distinct, don't blame us. Our photographer was standing on the tuba player for the shot when he inadvertently caught his left foot in the bell. We hope to have him extricated in time for the next combination Underground Saturnalia and Girls' Glee Club picnic.

GREETINGS to all men from the University of Hard Knocks and Raw Deals by its faculty of prospectors whose sun-blistered brows, bunioned feet, seatless pants, crock hair cuts, and insanely glittering eyes show that they have qualified as bone-fried, desert, country-type prospectors and uranium hounds, thoroughly tested by blazing suns, freezing winds, reddish sandstorms, hungry scorpions, and the tall tales of crossroad and county seat barroom liars and promoters; prospectors who have blistered their rumps riding burros and jeeps, have gone without baths and women, have trekked over deserts, climbed buttes, swum rivers, run rapids and jumped arroyos—not to mention a few claims; who have sat on cactus, killed buckskin out of season, rattled at rattlesnakes, eaten stewed rabbit and porcupine and, in desperation, tried a bobcat roasted in its own fur jacket; drunk skillet coffee, and smoked other men's cigarette snipes; men who have located, mined and milled uranium and who have drilled dry holes on their own without using widows' and orphans' money, and discovered that multimillion dollar lawsuits are actually filed.

By virtue of the authority of having graduated from all the above experiences with heads bloody but unbowed and still unable to resist the "click-click" of a probable jackpot on a Geiger counter, we do hereby confer on Jesse "Concentrate" Johnson, the radioactive degree and title of Doctor of Uranium and do declare him entitled to all the rights, privileges, and appurtenances attendant on such a degree because of his having had comparable training and having shown the ability to survive in the jungles of Federal Bureaucracy under fire and still come out with uranium concentrates.

Charles A. Steen, chief prospector of the Royal Order of R. A. Prospectors.

William R. Square Deal McCormick, treasurer of Hardly Able Miners

E. H. Snyder, Pioche-Type Desert Rat

Mitchell Maybe Melich, barrister at Claim Jumping. (You jump 'em, I guarantee you title)

The telephone company hasn't asked us yet, but we've been pretty sure for some time that they're about ready to suggest that we reduce the number of calls coming into our Markets offices. Keeping close tabs on what's doing in about 80 metals and minerals involves Bell-ringing on a large scale and lately we've been getting the kind that start out, "What's the market for antimony? Who will buy asbestos? Do you have any figures on current demand for yttrium?"

Since one of our happier functions is to answer questions before they get asked, we've asked George Cleaver and Jack O'Connell to come out from under their weekly publishing of *E&MJ Metal & Mineral Markets* and their three monthly pages in the mining journal and give us some more stuff for the boys in the bazaars.

Page 200 is the start of the new feature "Mineral and Ore Markets," featuring antimony and asbestos. You'll be getting the others as the boys grind 'em out.

It's just another *E&MJ* campaign to keep the pearlywhites glowing on the voice with a smile.

Consistent Tradenames Dept., Outer Space Div.: The McDowell Co., manufacturer of the Flying Saucer, a pelletizing device which was featured in January 1957, *E&MJ*, has now come out with another design. The latest effort gives pellets of "goose-egg" shape and permits a larger size pellet to be formed. It's deeper than the saucer, more cone-shaped.

Without a contest among consumers, including offers of a free trip to Venus for the lucky winning couple, McDowell has named the new machine.

It's "Flying Cup." Natch.

Onkle Otto's Safegesprecken

Schtuffen der powder mit ein drillshteelen ist all offer der drift mit einselfshpredden.

Ist guaranteed curleyhair shuremaken ven der trolleywire gegrabben.

Outputten der shkull ven ist der cage moven gibt stars geflashen und birdsingen.

Ven schmellen der schtunken blatzenfusen schmokenpuffen is besser folker be shooner someblace odder.

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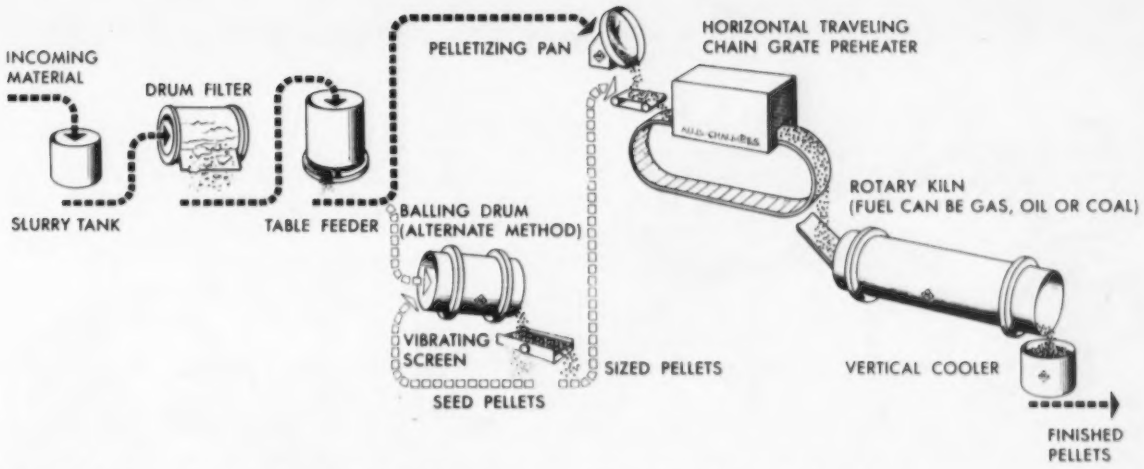
Ver poofen der grizzlydusten ist schmarter veren der schnozzlefilter den upgepuschen der stinkenlilly.

Besser instecken der shkull in der motorpuller ven highballen ein muckencar to der gedumpenpocket.



ALLIS-CHALMERS PROCESS is designed for low-cost heat treating of pelletized magnetite concentrate to make a hard durable blast furnace feed. Finely ground concentrates are first balled, then burned on a traveling grate and in a rotary kiln.

Process Cuts Pelletizing Costs

IMPORTANT ECONOMIES in fuel and maintenance costs, and virtual elimination of pellet breakage are claimed for Allis-Chalmers' process for converting finely ground magnetite concentrates into a properly sized, hard, durable, pelletized product for smelting. It combines the moving-grate and rotary kiln schemes of heat treatment and it requires no mixing of coal or coke with the concentrates. The company expects that its efficiency will hasten development of America's almost unlimited low grade magnetic iron ore resources.

Essentially, the process now offered the steel and ore mining industries consists of five steps:

1) forming pellets in a balling pan or drum,

2) drying pellets on a moving grate,

3) heating — partially oxidizing— pellets on a moving grate,

4) final burning of pellets in a short rotary kiln, and

5) cooling pellets in a vertical rotary shaft cooler.

Magnetic taconite ore, actually low grade magnetite ore containing 25-30% iron, must be crushed to a very fine powder (usually about 80% minus 325 mesh) in order to separate the iron mineral from the silica (quartz) waste. This concentration, usually magnetic, raises iron content to over 60%. But because powdered ore concentrate would be blown out of the blast furnace by normal draft necessary for operation, a number of methods for agglomerating the powder have been developed. However, Allis-Chalmers believes each method has involved one or more limitations in terms of high equipment, fuel or maintenance costs or excessive dust or pellet breakage.

Equipment used in the A-C process is same as the very compact ACL system for making cement clinker announced by Allis-Chalmers in August 1956 (see *E&MJ*, Sept. 1956 p 40 and Nov. 1956 p 98). Daily production rates obtained from pilot taconite operation range from 2.75 to 3 net tons of product per sq ft of grate area. Over-all length of combined equipment would be 250 to 325 ft for 3,000 tpd plant.

Fuel economy of system is a result of efficient reuse of exhaust gases from one stage of process to support reactions in others plus elimination of coal or coke in pellets. Consumption of fuel is between 700,000 and 800,000 Btu per net ton of product.

Heat is supplied initially by kiln burner. Although any conventional solid, liquid or gas fuel can be used for firing the kiln, for convenience propane gas was used in pilot operation. For commercial plants, choice of fuel will depend on which is most economical for a particular installation or location.

Primary air and fuel requirements are low because hot secondary combustion air is recovered from cooler where pellet temperature is lowered from 2000 deg F to about 350 deg or lower. Kiln exit gases of approximately 1800 deg F are used in preheating chamber of traveling grate unit to initiate formation of hematite structure. Similarly, exhaust gases from this zone, at 600 to 800 deg F, are drawn to drying chamber where they lose some of their heat to the bed of pellets before passing off to atmosphere.

At the same time, operating and maintenance costs are expected to be considerably below any other process achieving this fuel economy.

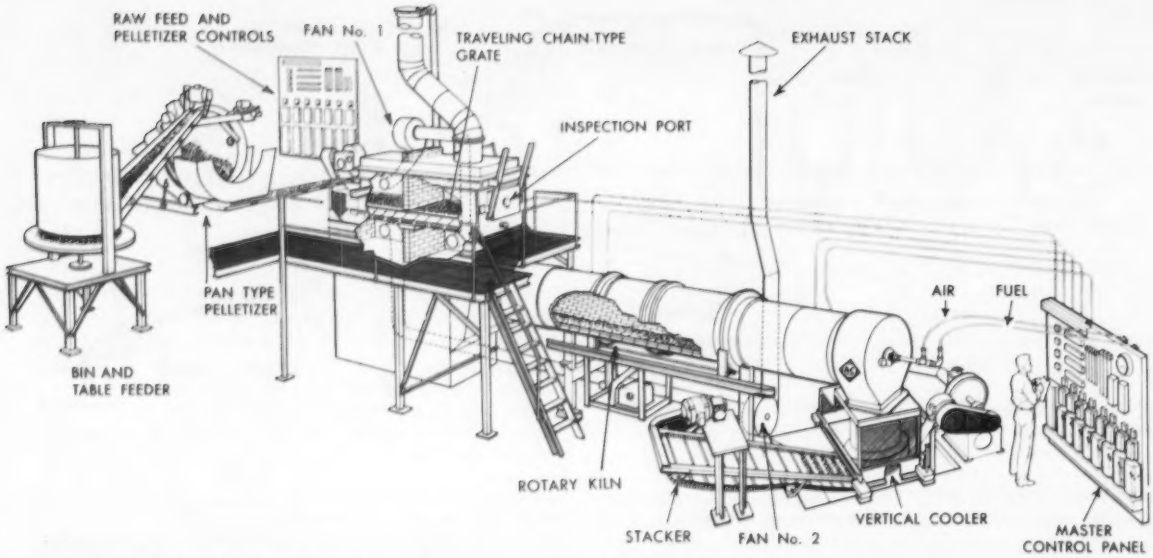
Furthermore, dust in kiln exhaust gases is effectively filtered out by the double flow through the bed of pellets.

Pellet breakage is reduced since the "green" low strength pellets remain at rest on the grate while being dried and given the preheating necessary to develop sufficient strength and durability for motion induced by the rotary kiln. Final burning further develops the strength.

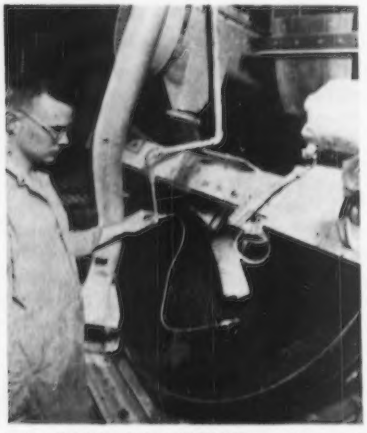
The product from this controlled heat treatment process is claimed a superior pellet of hematite. An established ASTM tumbling test (i.e. 200 revolutions of two-lifter-bar drum) produces virtually no broken pellets and only from 1 to 5% fines (minus 28 mesh) from surface abrasion. This is said to be a substantially harder product than that obtainable from other processes, based on published data.

Bulk weight of product is high— about same as green pellet, 125 to 140 lb per cu ft. In addition porous structure aids in reducing to pig iron in blast furnace and high grade, over 60% iron, increases blast furnace production.

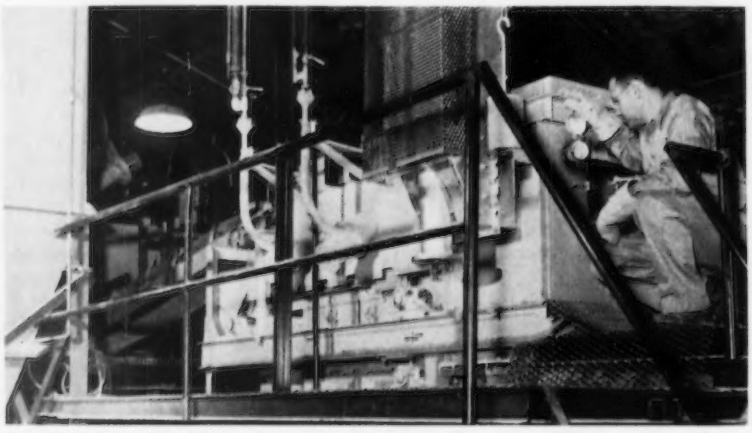
To test and evaluate the new process, following preliminary research work, scale operations were carried out at A-C's pilot plant facilities at Carrollville, Wis. Here engineers du-



PILOT PLANT, at Carrollville, Wis., proved process on magnetic taconite. Prototype equipment (above) will also be used to test large-scale samples of concentrate from ore producers. Research and development for heat treating hematite is now being conducted in an attempt to make a suitable agglomerated product from fine concentrates of this other major ore of iron.

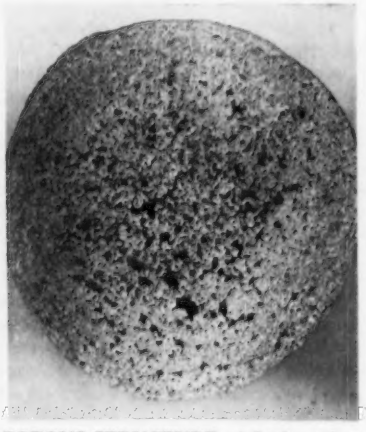


PAN-TYPE PELLETIZER makes uniform-sized balls from previously ground and magnetically separated taconite ore.

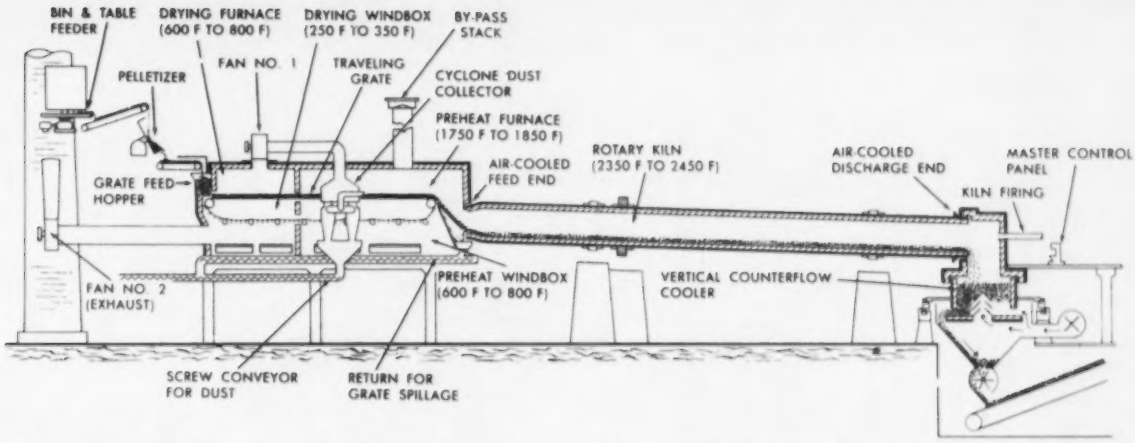


TRAVELING GRATE, having received bed of pellets from balling pan, first passes through drying chamber of furnace. Next, pre-heat chamber partially oxidizes and partially hardens pellets which then fall into end of rotary kiln.

ROTARY KILN gives pellets final oxidation and hardening. At discharge end pellets drop through vertical rotary cooler below firing hood. Stacker brings cooled pellets up to operating floor. Heat treatment controls are at this end.



POROUS STRUCTURE of final product cross-section aids in reduction to pig iron when smelted in blast furnace.


BIN & TABLE FEEDER
DRYING FURNACE (600 F TO 800 F)
DRYING WINDBOX (250 F TO 350 F)
BY-PASS STACK
PELLETIZER
FAN NO. 1
TRAVELING GRATE
CYCLONE DUST COLLECTOR
PREHEAT FURNACE (1750 F TO 1850 F)
ROTARY KILN (2350 F TO 2450 F)
AIR-COOLED DISCHARGE END
MASTER CONTROL PANEL
KILN FIRING
GRATE FEED HOPPER
AIR-COOLED FEED END
FAN NO. 2 (EXHAUST)
PREHEAT WINDBOX (600 F TO 800 F)
VERTICAL COUNTERFLOW COOLER
SCREW CONVEYOR FOR DUST
RETURN FOR GRATE SPILLAGE

SCHEMATIC cross-section of equipment shows Allis-Chalmers method of processing taconite (magnetic) concentrates. Over-all length of combined equipment would be about 250 to 325 ft for a 3,000 tpd plant. Any conventional fuel can be used.

plicated all stages of pelletizing and burning multiple ton sample batches of magnetite concentrates from many different sources.

Pilot plant facilities are available for customer tests and for work on ores from different mining operations. Research and development on modifications for heat treating hematite are are going forward and Allis-Chalmers engineers are confident that a suitable process will be developed for this other important type of iron ore.

The process begins with the formation of ⅜ to ¾-in. dia balls or pellets from the finely ground moist magnetic concentrates. This is accomplished by adding a small amount (about 0.5%) of bentonite as a binding agent and rolling or tumbling in a conventional balling pan or drum.

The pellets are then conveyed to a traveling grate enclosed in a furnace, which is divided into a drying chamber and a pre-heating chamber, each with a separate windbox.

The pellets first enter the drying chamber, where they are subjected to a suction downdraft of hot gases which have been exhausted from the pre-heat chamber at 600 to 800 deg F. After driving off the moisture from the pellets, the gases are exhausted to atmosphere at 250 to 350 deg F. Suction across bed is about 2-in. water gage.

The grate continues moving the pellets to the pre-heat chamber, where another suction downdraft (about 2-in. water gage) of hot (1750 to 1850 deg F), highly oxidizing gases from the rotary kiln initiates the conversion from magnetite to hematite (i.e. $4FeFe_2O_4 + O_2 \rightarrow 6Fe_2O_3$).

During this oxidation reaction, the newly formed individual grains of hematite bridge together by grain growth and recrystallization in a solid state to start formation of a hematite mineral structure within the pellet. This transformation develops sufficient crushing strength (100 to 200 lb) to withstand the tumbling action of the kiln. Bridging between the individual pellets does not occur due to the small area of surface contact and controlled temperature.

Heat treating is completed in the rotary kiln, where highly heated gases enter from the burner and complete the development of a network of hematite crystals within each pellet. Temperatures in the kiln must range from about 2350 deg F to not higher than 2450 deg F to assure development of optimum pellet strength, composition and structure. The small amount of dust and fines which are airborne in the kiln are carried along with hot kiln gas and filtered out as gas passes through the bed of pellets on the grate.

The pellets, after completing passage through the kiln, drop into the vertical cooler where fresh air lowers their temperature to about 350 deg F. Hot air is recovered and is used as secondary combustion air for kiln burner. Cooled pellets are then ready for shipment or temporary storage as blast furnace feed.

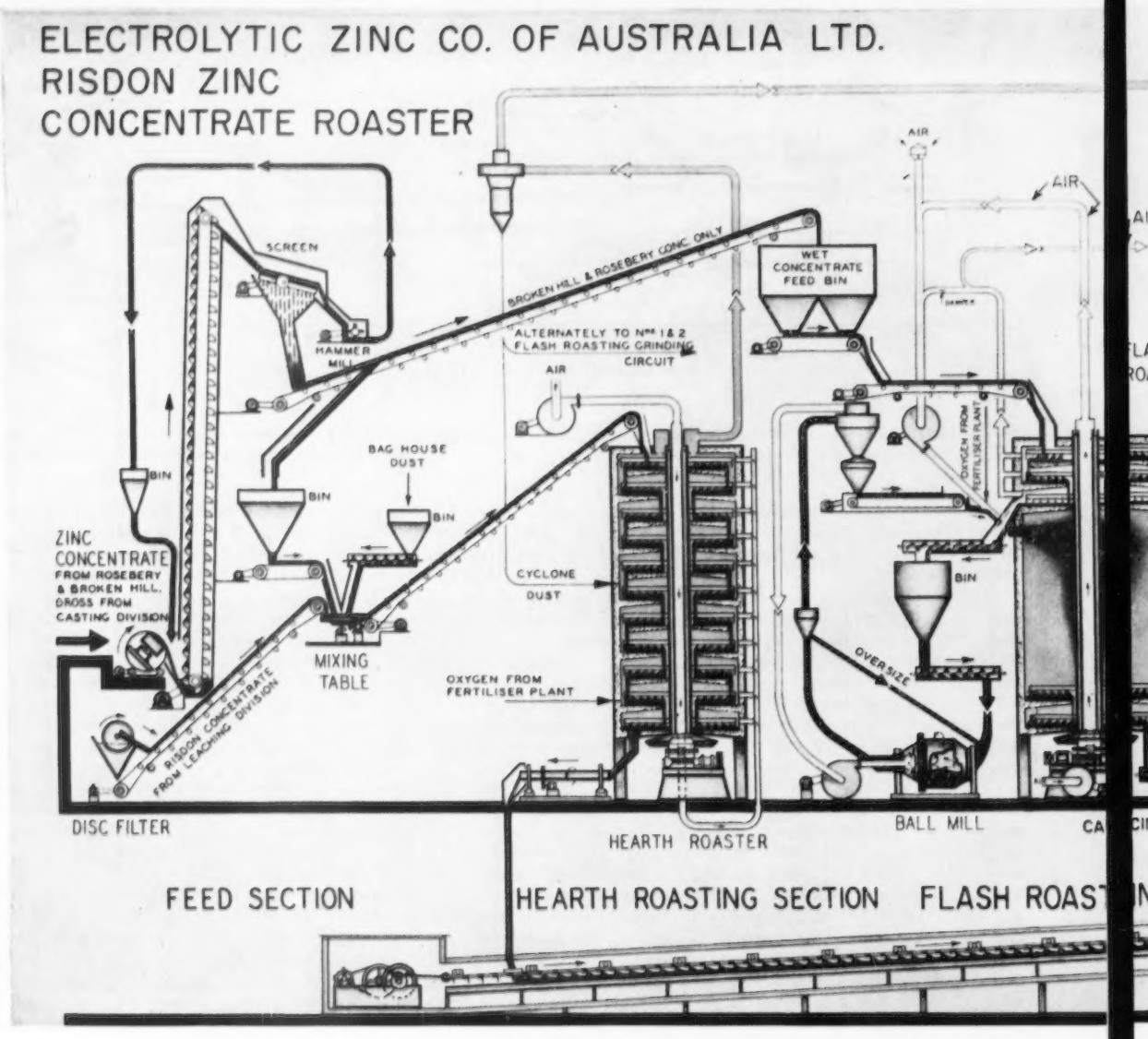
Present and Future Sources of Iron Ore for U.S. Steel Plants*

(millions of tons)

Year	Underground Ores (a)	Open Pit Concentrates (b)	Direct Shipping Ores (c)	Taconite Concentrates	Other Domestic Ores (d)	Imports	Total Supply
1952	15.5	18.5	44.0	0.1	20.7	9.9	108.7
1953	16.5	25.8	53.8	0.6	22.3	12.0	131.0
1954	17.5	17.6	29.6	1.0	17.0	14.0	91.7
1955	14.0	22.0	45.5	1.2	18.0	21.9	122.6
1956 Estim.	14.0	22.0	47.0	2.6	17.0	27.1	129.7
1960 Estim.	14.0	17.0	32.0	17.7	17.0	41.3	139.0
1965 Estim.	13.0	5.0	26.0	27.9	17.0	52.0	143.6

* Verne D. Johnston, consultant for Oglebay Norton & Co., Cleveland, as reported in *Barron's*.
(a) From Minnesota, Michigan, Wisconsin.
(b) From lower grade ores requiring benefication.
(c) From open pit operations.
(d) From Northwest, Southern, Western States.

PELLETS made from fine concentrates make exploitation of less choice iron ore deposits economically feasible. Their quality raises blast furnace capacity.



How Electrolytic Zinc Roasts Zinc

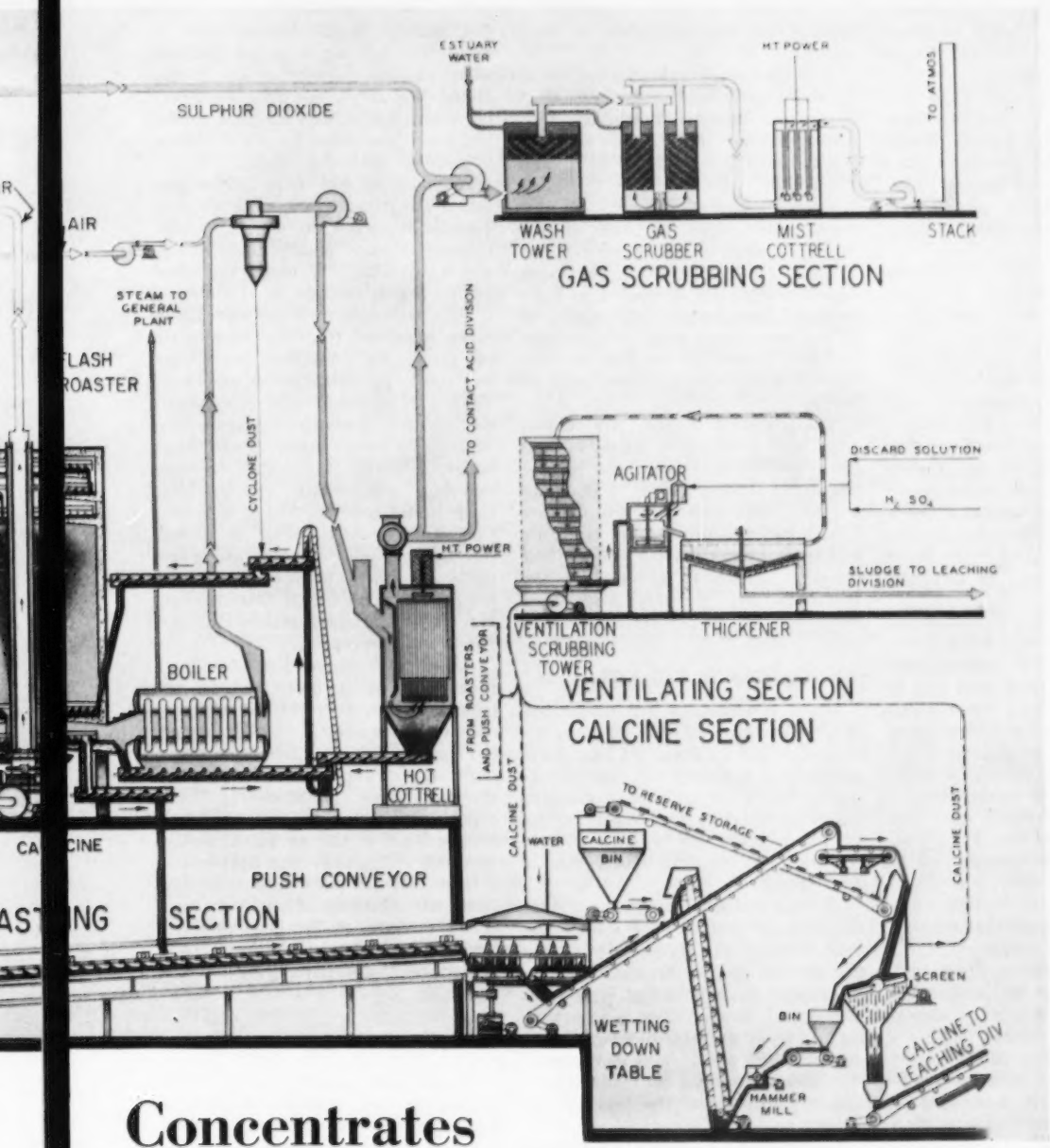
ELECTROLYTIC ZINC CO. OF AUSTRALIA LTD. produces about 100,000 tons zinc per year, plus cadmium and superphosphate fertilizer, at the Risdon Works, Tasmania, Australia. Risdon is eliminating the slime flotation section of the plant because of the efficiency of the Roaster Division operation. Primary residue, which was previously treated by flotation, now has a sulphur content low enough so that it can be sent to the filter plant without flotation treatment.

Roasting at Risdon is carried on in six furnaces. Two of the furnaces are hearth roasters, in which the concentrate is transported across successive beds or hearths, dropping from one to the other. The remainder are referred to as flash or suspension roasters, and, in these, finely ground concentrate is blown with air into a combustion chamber and the roasted particles are collected on a hearth located at the bottom.

Previous to 1943, the roasting at Risdon was carried out in Leggo and Herreshoff furnaces. The first hearth roaster commenced operation in March 1943, and the second in March 1944. November 1948 saw the commissioning of the first flash roaster, the other units following. These flash roasters were designed in consultation wtih Cominco of Canada.

Feed to each of these furnace groups is composed differently. Flash roasters receive a mixture of Broken Hill and Rosebery concentrates and some zinc-bearing dust collected in cyclones. Feed to the flash roasters is "high grade," containing some 51% zinc and 31% sulphur. Hearth roasters have a much lower feed grade, averaging about 52.5% zinc and 22% sulphur.

Basically, the hearth roaster feed is made up from local concentrate (Risdon) produced in Leaching Division, screened dross and baghouse dust, which are by-products of the Casting Division, and Broken Hill and Rosebery concentrates in sufficient quantity to maintain a reasonably constant



Concentrates

sulphur input, all thoroughly blended.

Some "high" sulphur calcine produced in Mainland roasting plants is blended in the hearth roaster feed, but this will only continue until stocks of Mainland roasted calcine are exhausted.

Operating the Hearth Roasters

Each hearth roaster has a throughput of about 100 tpd, and the flash roaster throughput is between 150 and 225 tpd, depending upon the furnace size and design of the associated product-removal equipment.

Raw material, transported from the foreshore dumps and screened at the Roasting Division, is delivered to the roaster bins by belt conveyors. Cyclone and baghouse dusts are pneumatically conveyed and the Risdon concentrate is delivered from the Leaching Division by belt conveyors. Hearth roaster feed bins have a capacity of 180 tons, and the flash roaster bins vary between 340 and 420. The various constituents of the feed to the hearth roasters are blended on a mixing table prior to delivery to the furnaces.

The hearth roasters are an adaptation of a design previously used at Wallaroo and Port Pirie, South Australia. They have 11 fireblock hearths contained within a mild steel shell measuring 35 ft high and 20 ft dia, and which is insulated on both sides against heat loss.

The outside is lagged with magnesia or similar material and the inside with insulating fireblocks. A central hollow column, made of cast iron sections, is used to support rabble arms, of which there are two for each hearth. Rabbles and column are cooled with air which, in turn, is used to provide some of the air required for the combustion of the concentrate.

Rabble arms are cast iron and fitted with special alloy steel tines which are so set that the concentrate, fed at the furnace top, is transported

across successive hearths, alternatively discharging near the center and periphery of the furnace.

Air used for combustion of the concentrate is fed to the furnaces through side openings to each hearth —the air being under pressure from a centrifugal fan. Air volume and placement are so regulated that hearth temperatures are maintained between 800 and 850 deg C.

Recently, by-product oxygen has become available from the Fertilizer Plant, and this has been used to enrich the combustion air being introduced to the furnace at the tenth hearth. One consequence of the use of oxygen has been a better over-all roasting efficiency.

Some oxygen of the combustion air displaces the sulphur of the concentrate forming zinc oxide, which passes from the furnace as roasted concentrate or calcine, and the sulphur combines with further oxygen to form sulphur dioxide gas of varying strength.

The gas leaves the furnace at the top, entering first of all a brick downcomer, in which some calcine dust settles, and then a mild steel flue in which it is carried, first through two cyclones in parallel for further dust removal, and then to the main gas removal system for additional treatment before release to atmosphere.

The calcine discharged from the furnace enters a cast iron spiral conveyor, which, in turn, transports it to push conveyors, on which it is joined by calcine from flash roasters, and goes forward for subsequent treatment.

Volume of gas deriving from each furnace is between 8,000 and 9,000 cfm, and 4 to 4.5% sulphur dioxide is contained therein.

Over-all result of roasting in the hearth roasters is to reduce the sulphur content from 22% in the feed, to 0.75% in the discharged calcine; thus the efficiency is of the order of 96.6%.

Operating the Flash Roasters

The flash roasters are constructed similarly to the hearth roasters, except that many of the hearths are not in position—a combustion chamber, void except for a column, being the place where roasting is effected. Structurally, the first three flash roasters each correspond to a hearth roaster of 12 hearths. The upper three hearths are used for drying the wet concentrate with gases taken from the furnace proper.

Combustion chamber, which is the equivalent of seven hearths, has a collecting hearth, under which is a final, or discharge, hearth. In the fourth furnace, the chamber size is increased to the equivalent of nine hearths.

The first three furnaces are 39 ft high, 20 ft internal diameter, with a combustion chamber height of 21 ft; corresponding dimensions for the fourth furnace are 45 ft, 20 ft, and 27 ft 4 in.

Central rotating column is of the same construction as that of the hearth roasters, but has been modified to take four rabble arms. The lower hearth rabbles are air-cooled, and the teeth of these hearths are made of 27% chrome steel. Before concentrates can be successfully roasted in this type of furnace, they must be dried and ground.

Hot gases for drying are drawn from the combustion chamber and distributed over the three drying hearths in such a way as to maintain a temperature near 300 deg C. The concentrate mixture is taken from the wet feed storage bin by inclined belt conveyor and fed to the center of the first drying hearth through a pocketed valve rotating on an horizontal axis.

Calcine Is Ball Milled

Dried concentrates are discharged from the third hearth at approximately 160 deg C, and fall through a grizzly to a Hardinge ball mill operating in closed circuit with a classifier and cyclone. The ball mills of the smaller roasters are designated 8x4-ft, while the largest roaster has a 10x3-ft unit.

Ground product is exceedingly fine, being on an average 95% minus 325 mesh (Tyler). For successful roasting, fine control of the furnace feed is essential. This is achieved by a variable speed rotary valve discharging into a heavily crowded hopper, which, in turn, feeds into a belt conveyor—the final adjustment is made by a sliding gate fitted to the front of the hopper.

Compressed air injects the concentrate feed into a flue along which it is blasted by a fan through a burner nozzle into the combustion chamber of the furnace. The air for the blast is a mixture of grinding circuit "bleed," drying hearth gas and "new" air obtained from either the wet concentrate feeders, column cooling, or the atmosphere.

Initial combustion chamber temperature is in excess of 950 deg C, and is obtained by using an oil burner. At this temperature the concentrate "flashes" and a temperature sufficient for roasting to continue without the use of exernal heat is maintained autogenously. Temperatures as high as 1050 deg C are reached in the chamber middle, while those near the bottom are but slightly lower.

Finishing hearth temperature is reduced to 850 deg C by gas returned after passage through a waste heat boiler. Not only is the calcine temperature lowered, making handling easier, but some protection against corrosion is given to the boiler tubes.

Calcine discharges from the furnace into a water-cooled screw conveyor or a series of such, from which it is delivered to push plate conveyors, in which it is joined by calcine produced by the hearth roasters.

Approximately 50% of the calcine make is carried from the furnace by the gas stream. To recover this calcine and also to produce a gas satisfactorily clean for sulphuric acid production, the furnace gases pass successively through a three-drum waste heat boiler, cyclones, and finally through two-stage electrostatic precipitators. Each boiler contains 772 steel tubes. Chemically treated water is passed through the tubes and the heat given up by the gases is used to raise steam for general plant use at 250 psi from No. 1 and 2 furnaces and 450 psi from No. 3 and 4 furnaces.

About 60% of the total dust load is deposited in the boiler and the gas temperature is dropped by approximately 500 deg C. Cyclones following the boiler collect a further 25%, while most of the remainder is caught by the electrostatic precipitators, where efficiencies as high as 98% are being achieved. All calcine caught as dust is returned to the collecting hearths.

In recent months, by-product oxygen from the Fertilizer Plant has been added to some of the flash roasters. Results obtained from the use of this additional combustion agent are encouraging.

Handling the Calcine

To prevent dusting during subsequent handling, calcine discharged from the furnaces is sprayed with water on wetting down tables—the calcine being moved on a rotating table, stirred with teeth or tines, and sprayed with water. Moisture content of the wetted calcine usually varies beween 6 and 7%.

Two wetting-down tables are in operation, one taking calcine from the hearth roasters and No. 1, 2 and 3 flash roasters, and the other dealing with the No. 4 flash roaster product. A third table, of different design, is retained for emergency use.

After wetting down, calcine is transported by belt conveyor to a screening station. Here it is passed over 2¾ mesh screens. Undersize from the screens goes forward for subsequent treatment in Leaching Division, while the oversize is crushed in a hammer mill and elevated back to the screens.

Scrubbing Exit Gases

All gas deriving from the hearth roasters, after passing the cyclones, passes directly to the gas scrubbing section located near the foreshore. Flash roaster gas may either pass to the foreshore direct or be diverted to the Contact Acid Division for conversion to sulphuric acid. The exit gases from the acid units join the roaster gases prior to scrubbing.

Gases for disposal usually contain about 4.0 % sulphur dioxide, and before they can be released to atmosphere it is necessary to reduce them below 50 ppm, or 0.005%. This is accomplished by scrubbing the gases in estuary water, by which action most of the SO_2 is absorbed by the water and discharged to the river through a submerged wooden pipe.

Before discharge to atmosphere, gases are passed through a set of wet electrostatic precipitators, ten in parallel on one scrubber set and eight in parallel on the other set. These treaters consist essentially of a series of lead tubes, down each of which is suspended centrally a star-shaped, lead-covered steel wire. Electric current as high as 60,000v is applied to the units, the metallic and acidic particles being drawn from the gas stream by electrostatic attraction. Deposits are washed from the treaters at regular intervals.

Treated gas then passes through fans, one for each set, and is discharged to atmosphere through wooden stacks, the higher of which is 133 ft above ground level.

Adequate Ventilation Installed

To ensure good working conditions, it is necessary to ventilate dusty parts. All furnace doors, barrings chutes, push conveyor housings, and wetting-down tables are connected to either one of two ventilating systems.

There are two separate systems. The newer one is associated with No. 4 flash roaster and the older with the remaining roasters. Each is equipped with a fan of maximum 100,000 cfm volumetric capacity, delivering the dust-laden air to the base of a wooden tower packed with wooden slats. Gas on its way through the tower meets a downward stream of liquor discarded from Leaching Division and to which it gives up its dust burden. The gas emerging from the open tower is practically dust-free.

The irrigating liquor is run to a settler, where it is thickened and adjusted with respect to its acid content before being pumped back to Leaching Division.

E&MJ would like to thank Harry Hey, managing director, and the Electrolytic Zinc Co of Australia Ltd. for permission to run this article which appeared in the *E. Z. Review*, June 1957. Last Spring, N. S. Kriby, general smelter superintendent at Risdon was appointed a director of the company. Deputy general superintendent is S. W. Ross. A. S. Gill is assistant general superintendent-technical, E. M. Giblin is assistant general superintendent-engineering, D. H. Johnstone is assistant general superintendent-industrial, and J. Hooper is chief mechanical engineer at the Risdon works of the Electrolytic Zinc Co.

Safety Features of the Koepe Hoist

THE OPERATING FEATURES of the Koepe hoist system are the same as those of passenger elevators which safely transport millions of people from floor to floor in the highest buildings in our country, reports E. D. Cory, U. S. Bureau of Mines, in the *National Safety Council News Letter*. These principles include the following—

Sufficient friction must be developed between the rope and the hoist pulley to prevent slipping of the hoist rope on the hoist pulley under any condition of normal or maximum permissible operation.

For safe operation, the hoist rope and the rope groove in the hoist pulley must be kept free of any material which will reduce the friction between the rope and pulley, and the maximum load to be transported must not exceed that for which the particular hoist was designed.

If the cage, skip or counterweight of a Koepe hoist installation is jammed in the hoistway, the rope pull on the jammed side will increase or decrease, depending on whether the intended motion is up or down.

This automatically changes the ratio between rope pulls on the two sides of the hoist rope when hoist operation is attempted; and if the jammed condition is not relieved, the ratio will increase to a value which permits the rope to slip on the pulley.

When the hoist is properly designed and the rope properly applied, this slip will occur considerably before the hoist or the rope is dangerously overstressed.

To prevent the rope and the pulley lagging due to slipping of the rope, a well-designed hoist is equipped with a rope slip relay or switch that automatically acts to stop the hoist motor and apply the brakes if the motor is running and the rope does not move.

To prevent overtravel at the top or bottom of the hoistway by a cage, skip or counterweight, conventional shaft limit switches and limit switches which are driven by the hoist through the same mechanism that drives the hoist indicator are used to stop the hoist motor and apply the brakes.

In addition, safety wedges are recommended as a final mechanical stop for the cage, skip or counterweight. The wedge is made by flaring out the top and bottom ends of the guides or runners so that a long, slightly tapered wedge is formed.

If the guide shoe of the cage, skip or counterweight proceeds beyond the point where it should stop at the end of travel at the top or bottom of the hoistway, the wedge gradually enters and binds in the shoe.

This action decelerates and finally stops the cage, skip or counterweight. When a stop occurs, the action and results are the same as for jamming of the cage, skip or counterweight.

Recent Koepe systems have been widely equipped with two or more hoist ropes and two or more balance ropes. In this case, the ropes are installed parallel to each other and equally share the load which is imposed. The hoist ropes lie in parallel grooves in the hoist pulley lagging and, at one end, are attached to an equalizing device (such as a whiffletree) attached to the cage, skip or counterweight.

At the other end, the hoist ropes are attached directly to the hoisted object.

The use of two or more hoist ropes practically eliminates the danger due to rope breakage.

Safety dogs, devices which shave off or dig into the guides in case of slack rope, are desirable on Koepe hoists and should be used on any man cage. Safety dogs guard against failure of rope attachments and supporting linkages, even though the failure of these devices may be very remote.

Other desirable devices are—loss of power relays, overspeed devices, slowdown at end of hoistway devices, automatic brakes, and backout switches.

Eight producing areas in the Western States are sending iron ore to the expanding steel mills of their area and are helping to supply the growing iron and steel industry of Japan.

Colorado Fuel & Iron, Kaiser Steel and U. S. Steel, with new customers in the growing population centers of the area, will be requiring more and more iron ore. British Columbia, shipping to Japan at present, also has plans for its own steel mills.

Here's a roundup of sources as . . . . . .

Western Iron Ore Output Increases

THE ASCENDANCY OF THE WEST as the center of population is being reflected in the intensive demand of the eleven states for iron ore. The larger part of present and proposed western output is destined for U. S. Steel's Columbia-Geneva plant at Provo, Utah; for Colorado Fuel & Iron's plant at Pueblo, Colo.; and at Kaiser Steel's operation at Fontana, Calif.

Fontana is undergoing an expansion program which will boost annual capacity to 3-million ingot tons on completion, making it the largest steel mill in the West.

A second destination for western iron ore, looming larger with each news report, is the renewing iron and steel industry of Japan, which has already signed several contracts in the U. S. and British Columbia and is reportedly negotiating more.

A survey of the expanding operations shows a birth of new mining districts and a re-birth of areas known for other metals in the past:

Riverside County, Calif.: Output will be increased 40% at Kaiser Steel's Eagle Mountain mine when planned expansion of the beneficiation plant and railway system extension are completed.

Eagle Mountain produced 2,650,000 tons of ore last year from its hematite-magnetite deposit. Ore averages 51% Fe, is upgraded to 60% by flotation, magnetic separation and heavy media process. Plus 1-in. dia ore is crushed first. Eagle Mountain is the principal source for Fontana works.

Beaverhead County, Mont.: Minerals Engineering Co. has a deep drilling development program under way on its Carter property, where some 52-million tons of ore have been blocked out. Company says that early drilling work would prompt an estimate of 280-million tons of ore to yield 100-million tons concentrates grading 63- to 65% following surface mining.

Japan seems the likely customer for the Carter ore, with some possibly being sent to domestic steel mills.

Humboldt County, Nev.: Some 300 tpd of high-grade iron ore is being shipped to the Youngstown Sheet & Tube plant at Gary, Ind. from the Iron King, 31 miles north of Jungo. Mine, owned by Will Austin, ships ore direct to the open hearths.

Pershing County, Nev.: Three operators are mining 1,200 tpd iron ore from their properties, with major output going to Japan. Mineral Materials Co. is mining and processing 800 tpd south of Lovelock and putting it through an 800-ton mill which contains a jaw crusher, rolls and a magnetic separator. Ore goes to Japan.

Nevada Iron Co. is mining 100 tpd of high grade for shipment to Kaiser's Fontana and Japan. Mine is open pit.

Three hundred tpd, mined in Pershing County by Dodge Construction Co., is being shipped via Stockton, Calif. to Japan following treatment by jaw crusher. Ore is mined from an open pit on property leased from Nevada Iron.

Lyon County, Nev.: Open pit mine near Wabuska, owned and operated by Standard Slag Co., is producing 1,200 tpd. Ore is crushed and put through magnetic concentrators at the mine site before shipment to Stockton, where it is loaded onto vessels bound for Japan.

Iron County, Utah: The various deposits of Iron County have combined reserves of more than 350-million tons on a measured, indicated, unclassified basis, according to U. S. Bureau of Mines. Unclassified reserves in the Bull Valley area are set at 950,000 tons. Ore is both replacement and vein type. Over-all average of ore

mined is 52% Fe. In measuring reserves in the area, only plus 45% ore was considered.

U. S. Steel's Columbia Iron Mining Co. owns and operates two magnetite-hematite mines in Iron County—Iron Mountain and Desert Mound. Grades run 45- to 50% at the properties, 22 and 12 miles west of Cedar City, respectively. Some 3-million tons per year are produced from the two open pits and shipped to the USS Geneva works, Columbia-Geneva steel division, without any more beneficiation than primary grinding and crushing.

Two other Iron County properties are the Blow Out and Comstock mines, owned by Colorado Fuel & Iron Corp. and operated by Utah Construction Co. Unofficial estimates of their combined output is 1-million tons per yr. Hematite-magnetite ore, averaging 45% Fe, is mined by open pit and shipped to CF&I's mill at Pueblo without upgrading.

Utah Construction also operates its own property—the Iron Springs Mine—at Cedar City, 20 miles east of the Blow Out, where output exceeds 60,000 tpm. Ore is shipped to Geneva works or Kaiser's Fontana, and is mined selectively to meet customer specifications. Both blast furnace and open hearth lump ores are produced from the magnetite-hematite orebody, which averages 55- to 60%. UCC crushes and screens the ore before shipment but does not upgrade.

Platte County, Wyo.: CF&I's own mine, the Sunrise, is operated by the company and produces 3,300 tpd of shipping-grade hematite. The only producing iron mine in Wyoming at present, the Sunrise started out as an open pit and shifted to block caving in 1942. Ore goes to Pueblo.

Fremont County, Wyo.: Center of attention these days is the new Atlantic City project of Columbia-Geneva steel division. Leslie B. Worthington, division president, emphasizes that it is still indefinite whether U. S. Steel will go ahead with development, but intensive test drilling is under way.

Option on the 1200 acres, purchased from the Ruby Co., Boise, Idaho, was exercised last June for a 75-year term, unless Columbia-Geneva decides to terminate it earlier. Decisions on going ahead with the project may be available by April 1958, Worthington indicated. Mine would be an open pit.

Grade of ore, according to U. S. Steel, is about 32% and would be processed before sending to mills.

Non-company observers have estimated that crushing and beneficiation facilities would run over $15-million. Ore would be shipped to the mill at Provo.

British Columbia's iron mines are located principally on Vancouver Island, with one property on Texada Island and operated by Texada Mines Lt. Latter is an open pit which ships to Japan.

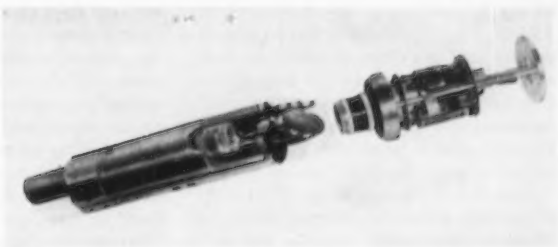
Texada's chief ore, magnetite (approximately 45%), is currently being mined at the rate of 2,000 tpd. Dry and wet magnetic separation in conjunction with flotation of sulphide impurities is the beneficiation process for the Texada ore. West Germany also receives some of the mine's output but in minor quantities. Firm is owned by U. S. interests.

In March, the federal government passed legislation enabling it to tax all properties producing iron ore, but the tax has not yet been applied. Pressure was brought on the legislature to slow exports to Japan.

Vancouver Island, B. C.: Empire Development Co. (in conjunction with Mannix, Ltd. and Quatsino Copper Gold Mines Ltd.) is operating the district's newest iron ore property. It is located on land leased from Quatsino, south of Port McNeil. Monthly output of 40,000 tons is due this month. Open pit will produce a final product of 58% after upgrading via wet and dry magnetic separators.

A three-year contract for a total of 1.3-million tons of the magnetite ore has been signed with Japanese interests.

Iron Hill mine, near Campbell River, was mined out and mill and cleanup operations were completed in July 1957. Mine had produced 58% Fe magnetite from a 3,000 tpd open pit. Wet and dry magnetic separation was applied before shipment from the Campbell River dock to Japan.

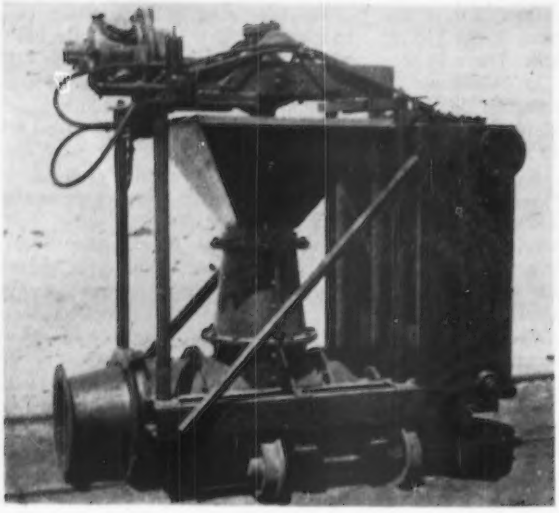


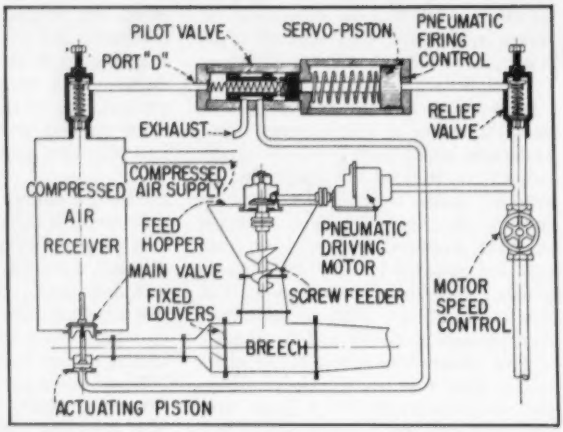
TELEVISION PROBE (left) is hollow steel tube with window in middle and conductor-type hoisting cable attachment at right. Inside tube is tiny television camera (far right) and, at lower end, mirror assembly (right). Angle mirror is encircled by six lights. Jar-like device is for sensing orientation, and controls rotation accomplished by motor in housing.

Borehole Television Developed In Germany

TELEVISION PROBE for direct studies of geological structures in small borings up to 1,000 ft has been developed by Grundig Radio-Werke GmbH in Fuerth (Bavaria) in co-operation with the engineers L. Mueller, Salzburg (Austria), J. Hunger in Kiel, and Winifred Petri in Munich McGraw-Hill World News reports.

The 2.4-in. dia probe can be used in borings of 2.5-in. dia—even if filled with water—independent of the direction and straightness of the boring. The probe is equipped with a motor-driven revolving mirror mounted on an eccentric Carden shaft. Illumination scheme allows observation of hole walls and orientation by polar coordinates. Taken by a miniature television camera—reportedly the smallest up to now—the picture is transmitted by a control set, which is installed above ground, to the screen. The whole equipment can be installed within 20 minutes.





COMPRESSED AIR from mine system is used to shoot slugs of minus 3-in. waste fill through pipes up to 200 ft long.

Rio Tinto's New Pneumatic Stower Places Waste Fill Efficiently

EDWARD RICH

AN EFFICIENT PNEUMATIC PROCESS has been developed for filling the drift-like extraction openings at Rio Tinto pyrite-sulphur mine, Huelva, Spain. Experiments dating from 1929 have resulted in a compact unit in which 2.8-cu ft "slugs" of minus 3-in. damp waste slate are automatically shot out of an 8-in. dia pipeline up to about 150 ft long by sudden discharges of compressed air from an attached storage tank. Compressed air is supplied from regular 90-psi mine system and an extensible shaker and/or belt conveyor system is used to bring fill from supply raise to feed hopper.

The powerful ramming effect produces an excellent support for the ground and, being readily directed, one well suited for filling irregular voids as well as dangerous areas that can only be filled at a safe distance. It has effective ranges up to 100 ft of free flight.

Rate of stowing of machine can be as high as 31 cu yd per hr under fairly ideal conditions. But it has been restricted by lack of capacity in fill supply service. As matters stand, unit is running normally at between ⅓ and ½ speed and placing 40 to 45 cu yd of fill per shift. (This is equivalent to 13 to 15 cu yd per man shift versus 2½ to 3 cu yd for hand stowing.)

With ample supply of fill and normal ground conditions in the headings, rate should rise to 70 to 80 cu yd per shift. But in bad ground where much timber is used and must be removed, rate might not rise at all. Where there is nothing but pipe removal and siting to hinder operation, 120 to 150 cu yd per 8-hr shift should be stowed.

Operating crew consists of a chargehand and two helpers. Chargehand watches placement of fill at face, one helper controls raise chute feeding conveyor and second helper controls driving motor and addition of water. Lateral movement of discharge nozzle can be done by chargehand alone if installation has been proper. Other moves and pipe section removal requires all three men and an additional man for moving to new heading.

Air consumption depends on length of piping and rate of placing. With pneumatic feeding motor on machine, over-all consumption of air per cu yd of fill placed is about 1,100 cu ft for 60 ft pipe and 1,750 cu ft for 150 ft of pipe. At 31 cu yd per hr, this equals 580 and 950 cfm.

Costs have approximately equalled hand stowing at present wage scale even though adversely affected by insufficient fill supply. Once bottle-necks are removed costs are estimated at about 25% below those for hand work. This estimate is based on present costs of electric power, compressed air and repairs, which make up 58% of total, remainder being labor. In hand filling labor is 80% of total and any future wage increase will give pneumatic stowing an added advantage.

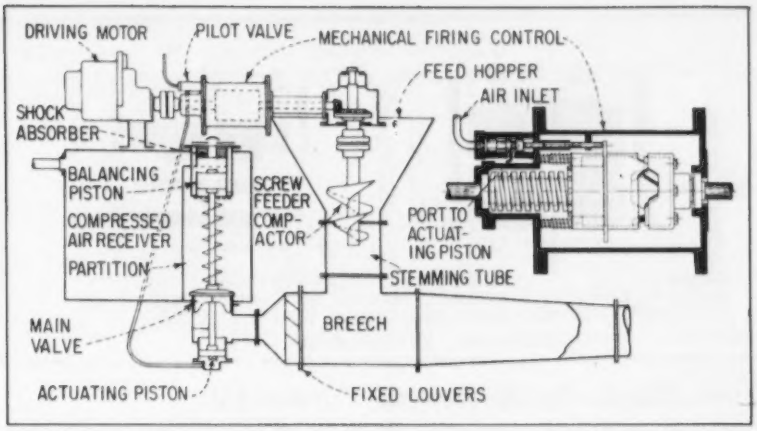
Wear Is Low

Wear on equipment is very low when decomposed and unaltered slate is used. In these conditions over-all repair costs do not exceed 10% of the total operating cost, but it must be appreciated that these figures apply when suitable fill rock is used and would, of course, be entirely different with a hard, abrasive rock.

Screw compactor usually requires a new flight at its lower extremity after between 1,000 and 1,500 cu yd have been stowed. Barrel pipes, if used well-aligned, exhibit little wear, the greatest being at the entry end, where, after about 5,000 cu yd, a short section of, say, 6 in. will have to be cut off and a new piece welded on. If angled more or less continuously wear is more pronounced, and new ends at the fill entry side will be required after 1,000 to 2,000 cu yd.

Before needing replacement a barrel pipe may be expected to handle between 30,000 and 40,000 cu yd, provided it is not always used in the same place, but is changed about with the others. This is because wear is naturally heaviest at the gun end of a barrel, where newer pipes are always

Mr. Rich is head of Planning and Investigation Department, Compania Espanola de Minas de Rio Tinto, S.A., Huelva, Spain. This article is a portion of a more comprehensive paper published in England as Transactions of the Institution of Mining and Metallurgy, Vol. 65, Part 12, 1955-56, as well as U.S. Patent No. 2,756,111, July 24, 1956.



ANOTHER MODEL uses mechanical firing control to achieve automatic, rapid discharge of air from receiver into breech. Designs are result of extensive tests.

placed, those showing greatest wear being fitted towards the discharge end. In this manner, as pipes begin to wear, they progressively get less work, as the end pipes on a line are always those to be removed first.

All other parts of the gun, including the breech and stemming tube, are long-lasting, well in excess of the best in barrel pipes.

Intermittent System Has Advantages

Chief object of new process has been to get high ramming effect with low consumption of compressed air. Secondly, it is desirable to use only air not needed elsewhere—a process which permits stowing with a few cfm or the maximum delivered by compressor—in contrast to usual pneumatic system which requires continuous minimum airflow.

Using only the surplus production capacity of any compressor installation naturally limits the volume of fill which may be stowed. If that falls below requirements, an additional or larger compressor is needed. Then an equal basis is established for comparison with a continuous system. However, the advantage still remains in the flexibility of the intermittent process since for the same amount of air some six machines could be operated as against one continuous stower.

Long pipelines would require excessive amounts of air with the new process and there seems no doubt that this intermittent system could not compete with the continuous ones on this point. But at Rio Tinto 200 ft is all that has been needed. Actual lengths have generally been under 150 ft. Critical length is probably between 200 and 300 ft if an average of, say, 100 cu ft of air per cu ft of fill is required by the continuous type system.

In any event, mechanical transport of fill is usually cheaper than pneumatic. For that reason piping through which fill is shot is kept short—the pneumatic impulse being just sufficient to give the desired ramming effect—and a shaker and/or belt conveyor system is used to bring fill from supply raise to feed hopper.

Sharp bends mean a considerable reduction in quantity of fill which can be fired per shot with this intermittent process, as demonstrated by the limited experiments on curves up to 90 deg and 6-ft radius. Bends also call for a good deal more air for this reduced quantity to be projected with the desired punch. An imitation of the continuous system with the gun placed at a great distance from the face and the pipeline turned through one or more bends of up to 90 deg is, therefore, quite impractical with this process as far as present developments go.

Of course, bends up to 45 deg are used immediately next to the breech when finishing off a heading. And they are used when a dome must be filled and the gun is of necessity sited close to it. For these bends, sections of 16-in. dia pipe with flanges forming wedge angle of 15 deg are used. Being of large dia and close to breech where velocity is low, the pipes wear little and have long life.

A special deflecting chute is used at muzzle of pipeline to fill domes in most cases. This deflector is bolted on and has adjusting screws to turn the shot as much as 22½ deg. Of course, there is considerable reaction with sharp deflection angles and some loss in punch.

Other, more gradual bends are possible in the pipeline because the pipe joints are of special design. Up to 7½ deg deflection per joint is possible, though rarely permitted. Adjustable joint is a muffle type since it must remain airtight.

Feeder and Firing Device Are Features of Gun

The patented gun, shown in photo above, was made in mine shop. It consists of two major parts: feeder and breech assembly and air-receiver and discharge valve assembly. An automatic firing control attached to feeder screw opens the main discharge valve when torque resistance of screw indicates proper charge has been compacted in breech.

Feed motor is an Ingersoll-Rand, 5-cylinder radial air motor which consumes about 80 cfm. Bevel gear is from rear axle of 2-ton lorry.

Feed screw, hopper, and stemming tube are of precise design resulting from considerable experimentation. Large particles do not jam, and fill is properly compacted for firing and to prevent blow outs.

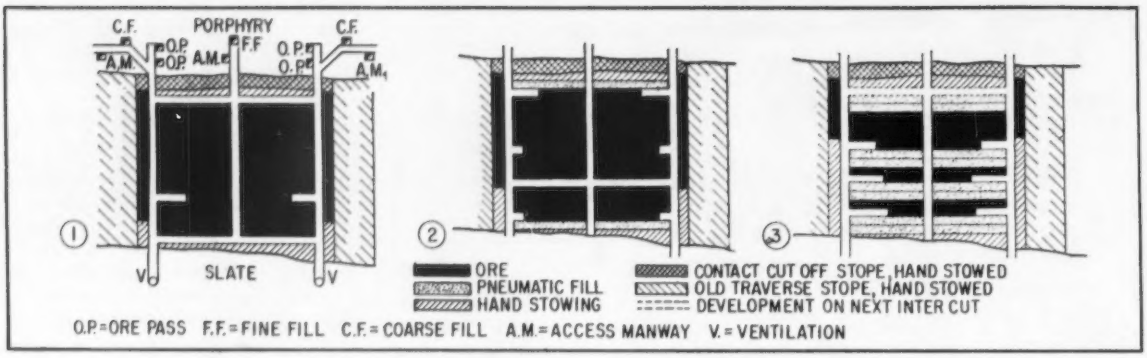
Breech and reducing pipe section is likewise of experimentally determined optimum shape and size for size of pipe, size of material and desired "plug" formation. Water inlets just below stemming tube flange permit adding a little water to dry fill to keep down dust and promote a good pack. Breech capacity is 2.8 cu ft. Louvres prevent fill from entering pipe from air receiver as well as direct air blast downward to clear breech.

Main valve assembly was developed to gain sudden discharge of large volume of air. Pressure in receiver acting on main valve is partially offset by same pressure acting on smaller balancing piston. When actuating piston is fed compressed air at proper time by action of firing control valve, pressure on main valve is suddenly unbalanced and valve opens so rapidly that there is an almost instantaneous burst of air into the breech.

Kinetic energy of main valve is cushioned by restricted exit of air above balancing piston and by rubber buffer shock absorber. Spring returns main valve to closed position. Firing control does not work unless receiver has built up proper pressure.

Receiver on Rio Tinto's gun has 14 cu ft volume and consists of three interconnected vessels that save space as compared to single large one. It serves for barrel lengths up to 60 ft if air pressure is 90 psi. For longer pipelines up to 150 ft, an auxiliary receiver consisting of a length of 8-in. dia pipe is connected to that of machine. It makes 24 cu ft total volume. Pipe is laid alongside track. Flexible connecting pipe of large bore allows for recoil of gun.

Where space is not critical a large



Rio Tinto Mines Panels By Horizontal Cut-and-Fill

MINING METHOD at Rio Tinto is horizontal cut-and-fill with stopes laid out on a panel system. It was described by C. R. Julian in Trans. IMM, Vol. 49, 1939-40. Original pillar-and-stall excavations were filled in early 1900's. At present, three crosscuts open panel for mining by drift headings. Headings about 7x7 ft are driven about 80 ft from side or wing crosscuts to center crosscut. Headings are backfilled, still mostly by hand, and successive sublevels or "intermediate cuts" are removed in similar manner progressing upward.

With this scheme, ore leaves by wings and fill enters by center crosscut in smooth flow. But settlement of roof in main crosscuts has been a problem since at times mining must be suspended while they are stripped up and repaired.

New process of pneumatic stowing has certain benefits because:

1) the much improved packs afford better ground support.

2) packs have ability to stand without shuttering (boarding up) when adjacent headings are driven alongside.

3) gun stows rapidly and completely over whole face.

Improved ground support permits an increase in number of headings on advance in mineral from two to three under favorable conditions, at least until there is insufficient area to accommodate that many.

Reduction in settlement has so far permitted intermediate cut to be mined completely without having to strip the service crosscuts.

Increased speed of filling cuts time to mine a sublevel. With hand stowing it takes 2 to 2½ yr, depending on area of stope, with gun it is 15 to 18 months so far as can be ascertained to date and 12 to 15 months is indicated for future.

Progress in typical pneumatically stowed stope is shown above. It is desirable to have an east drift heading and a west one on line so gun can fill from one site. Timing of breakthrough to center should be such as to permit completion of filling one pair before next breaks through. On average it takes 30 to 40 shifts to drive 80-ft heading and 6 to fill, including moving from site to site. This means stowing is in fortunate position of having to wait on extraction, a reversal of condition under hand filling.

Prevention of dilution is highly important in pyrite mining. Four factors contribute:

1) right type of filling material so packs stand up as faces break to them.

2) correct procedure during stowing (see stowing section below)

3) correct shape of extraction face, i.e. solid side of drift overhanging on 75 deg slope (see stowing drawing) to prevent toes of ore under fill as well as giving fill more stable slope.

4) correct blasting, i.e. 6-8 holes in two vertical rows, row nearest fill fired instantaneously and rest with millisecond or regular delays, all electric, so that first row further consolidates fill.

receiver can be used that will take care of longest pipeline needed. Economic flexibility for shorter lines can be achieved by partially filling the receiver with water. An open top partition, shown in right drawing, keeps water from valve apparatus.

Two types of automatic firing control—pneumatic and mechanical—have been developed and an electric one is feasible. Pneumatic controlled gun is in photo and adjacent diagram on leading page. Mechanical control is at right. Both are actuated by torque on feeder screw and both use small valve to send flow of compressed air to actuating piston. Also, all other components described above are the same.

With pneumatic control, feeder motor is rigidly connected to feeder screw. When screw seizes, driving motor stops. Back pressure in line rises and lifts spring loaded relief valve. This acts on servo piston which moves pilot valve which, in turn, admits compressed air to actuating piston on main valve of air receiver.

Compressed air going through pilot valve to actuating piston comes from air receiver. It enters pilot valve after first passing a spring loaded relief valve on receiver. This valve is nerve center of gun since it insures that necessary pre-set minimum air pressure is in receiver before gun can fire.

Mechanical control is between motor and feeder screw. It operates by disengagement of two mating dog clutches. One spring-loaded member is driven by motor, other drives feeder. When screw torque rises, 45 deg slope of teeth cause motor member to slide on spline shaft against spring.

Lateral movement moves pilot valve which admits compressed air to open receiver discharge valve. However, pilot valve does not move until clutches are completely disengaged. This is accomplished by a pair of similar secondary clutches that envelop and are concentric with the inner clutches. The secondary sleeves only start to disengage when main clutch is fully disengaged because teeth have different "land" length (see inset in drawing).

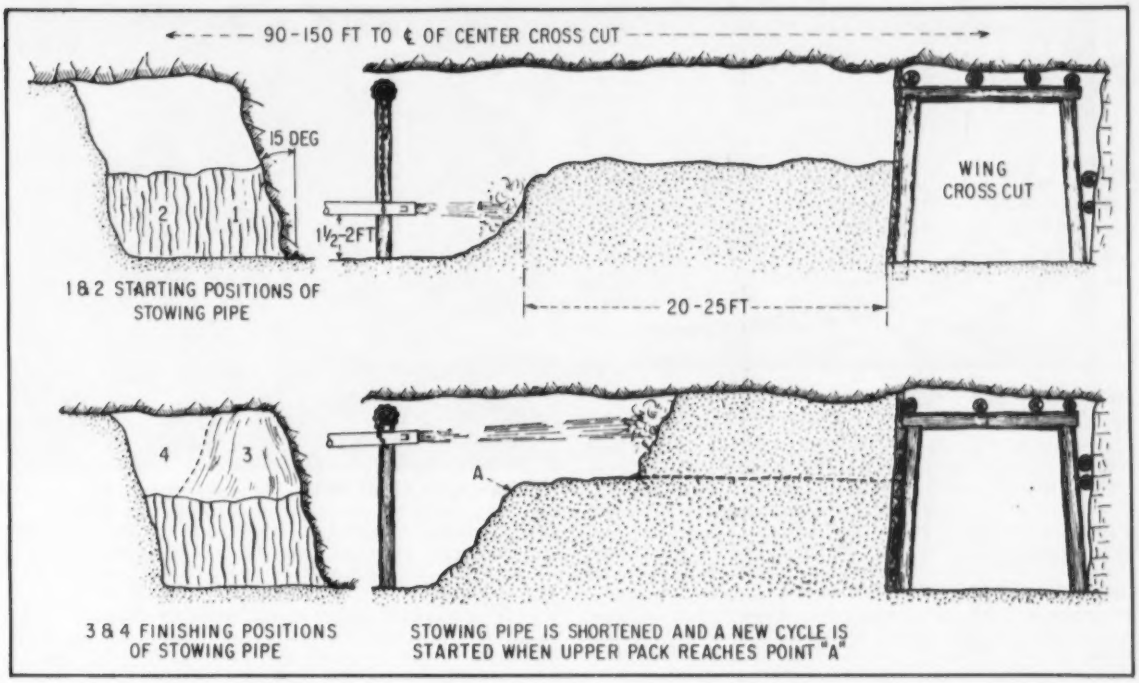
This delayed action is necessary so that gun will only fire when maximum pre-set torque on feeder has been reached. Otherwise, irregular compaction results and blow-backs are frequent.

Pneumatic control and pneumatic feeder drive motor has been standardized at Rio Tinto for simplicity and space saving. With mechanical firing control an electric motor could be used which would cut air consumption slightly. But speed control on air motor is simpler. The mechanical control also provides a "kick" to feeder which is useful in freeing screw when fill is sticky. But for most part, fill at Rio Tinto has been dry.

Screw jacks are incorporated in rear of gun just above center line of breech. Adjusted firmly against suitable buttress, they reduce and contain recoil which otherwise could lead to joint failure as well as be dangerous.

Stowing Is Carefully Done

Adoption of correct stowing procedure is the most influential factor in successful application of this process



STOWING is aided by several pipe support devices developed for use when timber is not present as above. High headings may require three rather than just two lifts as above. Density of pack must prevent packs settling faster than or before roof.

of filling. At start, erratic results came through failure to appreciate fact that the maximum density of pack is only obtained in the immediate neighbourhood of the point of impact of the shots on the 'target'. Such a core formed in this zone and roughly about a foot in diameter will contain from 10 to 15% of voids. Outside of this zone the percentage rapidly increases to between 40 and 50%, where little packing tendency is manifested and the characteristics are simply those of a pile of loose material lying at its natural angle of repose. It is therefore very important that the gun should not be kept pounding at one point only in a heading of normal dimensions for any length of time, but moved periodically across it on at least two horizons.

Procedure evolved is shown in drawing above.

Fill Material Should Have Certain Qualities

Suitable fill rock is most important. By far best packs are produced by the softer, partially decomposed rocks which, as a result, carry a moderate amount of clay. Those carrying finely dispersed sulphides will also produce a very good pack owing to the cementing action of the oxidation products which form in the course of time, but experience has shown that, for rapid work, the clay-bearing feed is much to be preferred to any other waste rock.

Under this category the rock available in great abundance at Rio Tinto is slate, which forms the whole of the foot-wall of the orebody and has been removed in enormous amounts by opencasting. It is largely unaltered except near the contact regions with the pyrites, where zones of highly decomposed material are to be found in considerable quantity.

These zones supply excellent fill, but become unworkable during wet weather owing to the considerable difficulty in transporting this material to the gun. It is particularly disposed to hang up in waste passes and to give trouble in screening and crushing, but once delivered to the gun is readily handled. Fortunately the wet season is usually of short duration in the Rio Tinto area, with the result that restriction in the use of this material lasts only for about two months in the year.

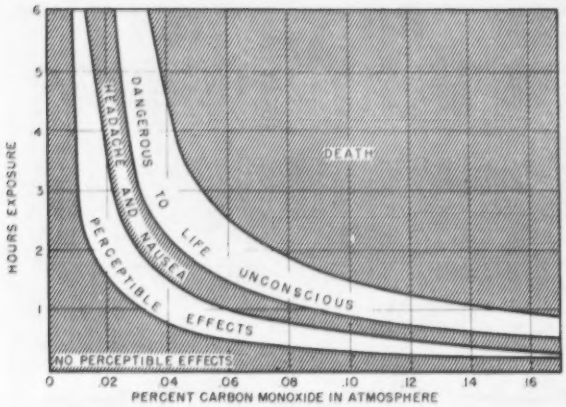
Hard rocks, such as the north or hanging-wall porphyry, unless decomposed and sulphide-bearing, make very poor packs. They also cause considerably increased wear to all the stowing equipment and they are only used in unavoidable admixture with slate. Clean, undecomposed slate of the Rio Tinto type when crushed to all minus 1½ in and rammed hard with the gun, stands well. It appears to contain a certain amount of free clayey matter released on crushing, which is probably the result of thermal effects produced during the formation of the pyrite orebodies which it contacts.

Mill tailings with about 5% moisture have been tested but it was difficult to deliver them underground. And the waste slate is abundant.

The better types of rock, namely decomposed slates, break fairly small when quarried. As a result they yield when loaded fully 25% minus 3-in., which is screened out ahead of 10x20-in. jaw crusher handling oversize. This crusher and screen discharge into waste pass connecting directly with center crosscut in panel stope.

Transport of fill to gun was carried out by overlapping shaker and belt conveyors. The former discharged on the latter after receiving feed directly from waste pass. Belt discharged into gun hopper. Belt, 80 ft long, was movable, being carried in a light truss on two trucks. Shaker length was changed as needed. Shaker has now been replaced by fixed belt for improved performance as to regular rate, capacity, and transport of wet fines.

Water must be admitted to breech to allay dust and make pack dense and tough. Quantity varies with type, size and moisture of feed with 1-1½ gpm per shot being a fair amount. Finer fill requires more. Indicating rotameter is used but operator usually judges correctness so that the sound of issuing shot sounds like muffled explosion.



EFFECTS OF CARBON MONOXIDE on humans is so lethal that air with only 0.02% (200 parts per million) may produce characteristic symptoms—headache, mental dullness, physical tiredness, dizziness and even nausea—in a few hours. Unfortunately, these are fairly common ailments and are frequently disregarded. Even if not enough CO is present to cause illness, fatigue and loss of efficiency may result from repeated daily exposure to quantities approaching allowable limits. Limits legally go as high as 100 ppm but 20 ppm is recommended. CO is absorbed by the blood 300 times faster than oxygen, which it displaces. Thus even a small percentage in the air will affect the body. Result is oxygen starvation

AT GAS SAFETY SCHOOL, Steel Division of Ford Motor Co., blast furnace and coke oven operating and maintenance men get complete training on use of approved oxygen breathing apparatus. Three at right are wearing compact, lightweight (13½ lb) Chemox mask and cannister, self-contained oxygen breathing unit made by Mine Safety Appliances Co. This is in education phase of gas protection program. Other phases include detection, work procedure and protective equipment. Result is a highly effective defense against CO.

Defense Against CO—the Silent Killer

R. D. BYROM

CARBON MONOXIDE is justifiably identified in the public mind as the "Silent Killer." Although lack of oxygen alone or the presence of any of a number of deadly gases can result in death, CO is usually considered the most lethal gas generally encountered in industry.

Because so many of Ford's Steel Division employees work in an area which could at any time be gas-contaminated, the division safety unit has undertaken an ambitious personnel gas protection program.

First, as in any safety program, is education. On-the-job training in use of breathing apparatus failed to provide us with the control desired so we constructed a gas school with the cooperation of W. S. Smith, safety director. This facility contains a repair and storage room in which masks are cleaned, repaired and readied for service. Second room is for classes; and the third is a gas chamber for conditioning employees to work in gaseous atmosphere.

All blast furnace and coke oven operating and maintenance employees take a complete training program. Maintenance men are required to take refresher courses twice a year. Detailed records are maintained so that no one is overlooked. After having demonstrated proficiency in use of all types of oxygen breathing apparatus used in the division, the employee is issued a qualification card which he keeps in his possession while working and must show to inspectors.

A number of well-adapted employees are selected for accelerated training and serve as a rescue squad. Through intensive drill they reach a point where they put on and use breathing apparatus with complete ease and familiarity.

Of course, the Gas Training School is but one facet of the Ford Steel Division's educational program. Everyone is made familiar with the physical symptoms of gas poisoning. They are made to understand the absolute necessity of abandoning, immediately, any area suspected of being contaminated and reporting their suspicions to a supervisor for action.

In addition, safety information and educational bulletins on such topics as artificial resuscitation, gas detection and histories of asphyxiation in other plants are regularly distributed to supervisors and used as topics at foreman-employee safety meetings. A booklet, "Correct Use of Gas Mask Equipment," has been prepared and copies are available from the Central Staff Training Department.

Second feature of program is gas detection. In addition to individual detection training mentioned above, routine gas detection for the Division relies basically on two instruments: a flashlight size Mine Safety Appliances Co. colorimetric carbon monoxide tester; and an electric MSA carbon monoxide alarm. There are 10 of the inexpensive first type accessible to shift foremen. The other type, being portable, can be kept in a central location and wheeled to a work area where disruption of dust and opening of supposedly purged tanks create a potential hazard. They are also taken to job sites where a constant atmospheric check is advisable. Eight are kept available. Both instruments are regularly calibrated and inspected by representatives of the Industrial Health Unit.

Gas detection is not simply a matter of sitting around waiting for an alarm to go off. Hazards must be anticipated. For instance, at the beginning of each shift, the safety engineer on duty checks the weather report. When wind direction and high humidity require, he uses the colorimetric instrument to check selected locations at least twice during his shift. It is believed several serious accidents have been avoided by this pro-

Mr. Byrom is safety engineer of Steel Division of Ford Motor Co.

TWO CO DETECTORS are used by Ford. Fast and simple to operate, the colorimetric tester (left) requires only five minutes instruction. Compact and weighing under one-half pound, it is inexpensive but precise for indicating from 0.001 to 0.10% (vol.) CO in air. To use, ends of replaceable indicator tube are broken and tube inserted in tester. Bulb is used to pass air through tube. CO turns yellow silica gel in tube to shade of green, intensity of which indicates concentration. Color scale alongside is for matching. Other vapors have no effect.

Automatic, electrically-operated alarm (right) sounds horn when CO reaches any set value from 100 to 400 ppm. Ford has movable units.

CO Facts

Carbon monoxide is a colorless, odorless, and tasteless gas. And since human perception of it comes only from its poisoning effect, practical detection is only by instrument.

It is lighter than air. Therefore it gathers in high points such as at tops of raises, stopes and buildings.

It is a product of incomplete combustion and is found to some extent in all smoke and fumes from burning carbonaceous material, as in furnaces, blasting fuses and explosives, fires, and internal combustion engines.

It is virtually insoluble in water—30 ppm. Therefore, water sprays and scrubbers will not remove it from air. Usual requirement is to dilute it with large volume of air, although at least one engine exhaust conditioner (Oxy-Catalyst, Inc., Wayne, Pa.) uses a catalyst which when heated oxidizes CO to CO_2. Legal minimum air requirements are usually 75 cfm per hp.

It is taken up by blood at expense of oxygen, thus causing oxygen starvation.

cedure and thus well worth the effort.

An important element in the program is that all areas with recurring gaseous conditions are posted and in many instances fenced in or roped off. As a further measure, maintenance work in locations where gas may be a hazard is scheduled for day shift whenever possible.

Types of breathing apparatus used in the division are worthy of mention. All are dual purpose in design, functioning equally well as an integral part of gas maintenance activities or for rescue work. Three units are used: MSA Demand oxygen mask; MSA Manifold-fed work mask; and MSA Chemox mask.

In areas where a workman habitually cannot enter without first donning an oxygen mask, such as on various levels of the blast furnaces, permanent oxygen lines have been incorporated in furnace structure. Also used are special carts containing three oxygen tanks equipped with four-man manifolds, multiple lengths of hose fitted with quick-disconnect couplings and a closed cabinet for the sterilized work masks. These are stationed throughout the blast furnace and coke oven area.

While these are the highlights of the gas safety program at Ford Motor Co.'s Steel Division, it is well to emphasize that its successful operation is based on awareness that fear can induce unpredictable reactions in people. Hence regular and repetitive drills under realistically simulated field conditions are an essential part of our defense against the "silent killer."

Watch For Nitrogen Oxides, Too

NITROGEN OXIDES are extremely dangerous. Their insidious character is given proper emphasis in a recent pamphlet of The Ruth Co., makers of widely used MRX diesel exhaust conditioners.

Regarding oxides of nitrogen, the pamphlet quotes from 1954 Transactions of American Conference of Governmental Industrial Hygenists; ". . . errors in appraising toxicity have occurred . . . nitrogen dioxide now appears to be a major contributor . . . urging a limit lowered to 5 ppm from . . . 25 ppm . . . (and) that future values be assigned to specific nitrogen oxides."

The nitrogen oxides are slightly heavier than air and practically colorless except for the dioxide (NO_2), which is brownish red. They are formed in combustion, particularly of ammonia. Blasting is a potential source. Raw exhaust from diesels under load is said to contain about 600 ppm of NO.

NO readily oxidizes in air to NO_2. While NO is only slightly soluble in water, NO_2 is highly soluble if pH is above 2.7, forming nitric acid.

Detection and analysis is not too simple but Mine Safety Appliances, for one, has a field kit using colorimetric scheme and solution.

Effect on humans is similar to infectious pneumonia — NO_2 forming acid on contact with moisture in lungs. Since oxides fail to set up defense reflexes, worker may inhale enough to cause death without knowing it. Ruth Co. says cases on record show that a man can feel perfectly well all shift, only to die next day.

Symptoms of poisoning are restlessness with shortness of breath, dry cough, and chest pains. These increase and are accompanied by frothy sputum tinged with blood. Death may follow from pulmonary edema, even after several days. There is no effective medication other than fresh air.

Although Peck (in CIMM Bulletin, Mar. '57) says experience indicates if CO is under 20 ppm there is little to fear from nitrogen oxides, Ruth Co. believes dilution with fresh air is not enough. Their MRX-type conditioner takes positive action to remove them by combining acid with limestone to form calcium nitrate sludge.

Salt Lake Tribune

"IT'S TIME TO USE our good common horse sense in adjusting ourselves to the present situation." Howard I. Young, AMC president (center) told the miners. Sen. Arthur Watkins of Utah (left) and Sen. Alan Bible of Nevada (right) also spoke.

AMC Convention Explores Remedies

TWO RESOLUTIONS adopted by the American Mining Congress at the Salt Lake City meeting Sept. 9-11 indicated that the present dilemma of major segments of the domestic mining industry stems from a temporary worldwide overproduction of minerals which is forcing prices to uneconomic levels and shutting down middle to high-cost producers.

The first resolution on general policy said "We are disheartened and alarmed by the failure (of a national mineral policy) to provide adequate protection for our domestic mining industry. It is the responsibility of our Government to see that foreign minerals and products fabricated from them are not permitted to flow unrestricted across our borders to stifle home industry and engender an economic revolution which could well be second only to the political revolution which has encompassed so much of the world in our day."

A second and more specific resolution "that Congress re-establish and exercise its authority over tariffs" and urged enactment of legislation as follows:

"(1) That as to those metals and minerals in which the United States produces a substantial portion of our domestic requirements, adequate import taxes be established, to be imposed and collected only if and when the average monthly price falls below a reasonable prescribed point legislated for each metal and mineral respectively; thus providing a market free of any duty for foreign imports so long as the average monthly price is at or above the prescribed point.

"(2) That as to those metals and minerals which are produced domestically sufficient only to provide a small percentage of our requirements, special governmental programs in line with the circumstances in each case should be instituted and maintained to encourage continuance of such industries.

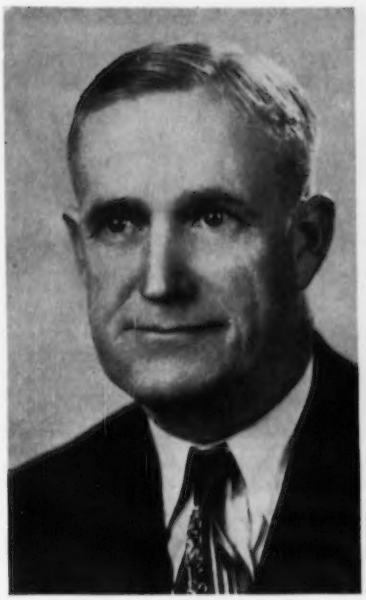
"(3) When the enactment or application of adequate import taxes and tariffs is not feasible, or otherwise fails to do what is necessary to protect the domestic mining industry, we recommend that import quotas be provided in cases where such device is practical.

"(4) We urge that Congress amend the Antidumping Act of 1921, to provide adequate provisions for greater certainty, speed and efficiency in administration and enforcement, particularly as applied to metals and minerals."

Howard I. Young, president of the American Mining Congress and chairman of the opening session announced "that a national mineral policy could never have been more important than at the present time," and introduced John W. Liebert who spelled out principal objectives of the Interior Department's long-range mineral program. These are: (1) sponsorship of research and development of technology for the industry, (2) establishment of a favorable business climate for the industry and (3) development of a mutually advantageous foreign mineral policy. Liebert joined other speakers in observing that "no healthy mining industry can be built on Government subsidies subject to the whims of Government agencies." He advocated that permanent contributions to industry should be made without continuing intervention of Government in markets.

This theme that industry would have to get along without Government props was underscored by V. E. Cooley, Deputy Director, Office of Defense Mobilization, who said that "strategic stockpiles are now in very good shape," and that "targets for expansion of industry have been met." In view of Mr. Cooley's remarks that "The stockpile purchases are now based on a wartime need of three years, rather than five years," Howard Young concluded that "Those of us in industry should now use our good common horse sense and adjust ourselves to the situation" by diverting production to industry and keeping out excess imports.

Speaking on tariffs, Sen. Arthur V. Watkins of Utah said that the cabinet



L. F. PETT, general manager, Utah Copper, presided at welcoming luncheon.

E. H. CRABTREE's session covered a look at tomorrow's mineral processing.

J. B. CLEMMER, USBM metals expert, explained liquid-liquid extraction.

For Overproduction of Minerals

approval for protective import levies for a domestic mining industry "represented a major breakthrough in our efforts to protect strategic domestic industries from ruinous foreign dumping." He proposed early imposition of lead-zinc tariffs under the escape clause of the Trade Agreements Act and expressed belief that studies which the Tariff Commission made in 1951 on the lead-zinc industry would enable it to make the necessary recommendations within three months, rather than the nine-month study period permitted by law. He also reminded the audience that "we have a live bill on the Senate floor that presumably could be speedily enacted in early 1958." Sen. Watkins predicted that failure to protect key American industries against excess imports in the near future would almost certainly spell the end of the Reciprocal Trade Agreements Act when it comes up for extension in May 1958.

This hint that the metal and nonmetallic mining industry should join other industries in seeking protection against excess imports was expressed more boldly by L. C. Campbell, chairman of AMC's Coal Division who told a luncheon audience if the coal, metal mining, oil and manufacturing industries stand together "we can keep America from becoming a dumping ground for minerals and manufactured products."

At least two speakers at the convention suggested that producers of foreign minerals have an obligation to respect the ability of markets to absorb products, and curtail production when demand for metals sloughs off. Senator Alan Bible of Nevada said in a convention issue of the Salt Lake Tribune that although the executive branch of Government could assist in protecting domestic industry, "there is another obligation, and it lies at the doorstep of some major mineral producers of this nation. How long will they continue to produce for the world market cheaply mined ore from their own foreign holdings? I believe that this segment of the U. S. mine industry has an obligation to curtail its production of foreign-mined minerals, when our own American mining industry is jeopardized from the production of these minerals." John W. Liebert also suggested that foreign mining companies must "share in readjustment, just as they shared in higher profits during the emergency."

If one had to rate the varying degrees of distress suffered by various segments of the domestic mining industry on the basis of talks given at the convention, it would appear that the strategic minerals producers have been hardest hit. Sam Williston's A-to-Z report of the status of various strategic mineral producers was downright depressing. In virtually every case, he showed that back-sliding of Government support and large imports of foreign minerals have virtually strangled strategic mineral producers. After listening to Williston's distressing report, Andrew Fletcher, president of St. Joseph Lead Co., commented to E&MJ's reporter that "compared to the strategic mineral producers, the lead-zinc industry is well off." A little later however, Sam Williston came up with a new definition of strategic minerals that placed lead and zinc in the same category. He said that "A strategic metal is any metal that can't compete in the world market."

The lead-zinc industry would rate second in the distress column. Charles Schwab, manager of industrial relations of the Bunker Hill Co., and chairman of the Emergency Lead-Zinc Committee said that failure of Congress to pass the recently proposed protective tariff legislation was due in part to the fact that "The House of Representatives does not know what is going on as far as mining is concerned in the West." Thus Schwab's observations pointed up the prophetic admonitions of Senator Bible at the 1956 Los Angeles AMC convention, cautioning the mining industry to draw up only bills which pro-mining legislators would be able

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KENNECOTT'S PARTY, held on the edge of the huge Bingham Canyon open-pit mine, was a high spot in the AMC convention activities. Busloads of convention goers were transported from the convention hall for the eventful celebration.

to sell to Congress and the public.

The copper producers would rate third on the distress list. J. B. Pullen, assistant general manager of Phelps-Dodge Corp. speaking on the state of the copper industry, said that long-range planning called for a 4% increase in output per year to take care of increasing requirements. He showed that since the peril point of 24c for domestic producers had been established in 1953, costs including wages, supplies, taxes, freight and marketing had gone up by 33.1%. This he argued would increase the present peril point for copper from 24c to about 32c per lb.

Strangely enough, no cry of distress came up from the speakers who covered iron ore and light metals at the "State of the Mining Industries" session, even though both industries are subjected to considerable competition from imports. R. C. Fish, vice president of operations, Hanna Coal & Ore Corp., said that the iron ore producers are engaging in a vigorous program to improve the grade and structure of iron ore by beneficiation in order to cut costs of steel production. He said that the steel industry is shifting emphasis from "cost of ore to cost of steel in the ladle." Steel costs can be reduced by 26¢ per ton for each percentage point reduction in silica content of concentrates such as taconite pellets, he said. Capital costs per annual ton of capacity for foreign ores runs about $46, he estimated, and as high as $55 per annual ton of capacity of taconite pellets in the domestic industry. He concluded, however, that the taconite capital costs might be lowered somewhat as present plants expand in capacity. He reviewed highlights in the Western Hemisphere iron-ore expansion program which indicated an optimistic long-range outlook for the iron and steel industry of the U.S.

Aluminum expansion programs were tallied up by S. B. White, vice president and general manager of Kaiser Aluminum and Chemical Corp.'s Metals Division. White said that the aluminum industry has doubled capacity every ten years since the turn of the century and estimated that the total present use of aluminum would double by 1965. His review touched upon bauxite exploration programs in Central America, Hawaii, Jamaica, Africa, South America and elsewhere.

Industrial Minerals

Total U. S. output of industrial minerals in 1956, not including fuels and water, reached a value of about $3.3-billion, a new record, some 6% higher than the 1955 record, according to R. J. Lund, assistant technical director, Battelle Memorial Institute. This, he reminded the audience, was just about 50% higher than the value of metallic ores produced which was about $2.2-billion for 1956.

About 70% of current U. S. reserves of uranium ore are situated in New Mexico; 16% in Colorado, Utah and Arizona; and 8% in Wyoming, according to P. J. Merritt, senior geologist, E. J. Longyear Co., who spoke on the state of the uranium mining industry. He said that some estimates of annual U_3O_8 consumption in the U. S. 20 years hence are as high as 100,000 tons, while others are as low as 10,000 to 20,000 tons per year. Equal quantities were estimated for consumption outside the U. S.

In a session on milling and metallurgy chairmanned by E. H. Crabtree, Director of Colorado School of Mines Research Foundation, the audience really got a good look at tomorrow's mineral extraction methods. J. Bruce Clemmer, chief of U. S. Bureau of Mines Mineral Technology Division, Salt Lake City and his associates J. B. Rosenbaum and J. R. Ross presented a paper on "Liquid-Liquid Extraction of Uranium." Clemmer explained that solvent extraction closely parallels the ion exchange process because the exchange of anions and cations in the solvent extraction process correspond to the resin loading cycle; and the uranyl stripping step of solvent extraction correspond to the elution cycle in ion exchange. He said that in uranium extraction the ion exchange process for clear liquids appears to be giving way to solvent extraction in newer plants. One advantage is the rapidity of solvent extraction compared to that of ion exchange. He said that 1 cu ft on conventional ion-exchange resin can be loaded with 3 to 5 lb of U_3O_8 a day, whereas 1 cu ft of 0.1 molar organic extractant can be loaded with ¼ to ½ lb of U_3O_8 and ordinarily produces 4 to 8 lb of U_3O_8 per day. A cubic foot of resin costs about $45 whereas 1 cu ft of 0.1 molar organic costs $3 to $4.

C. J. Lewis presented a paper on "Behavior of Metals Other Than Uranium in Liquid-Liquid Extraction Processes" which was co-authored by E. H. Crabtree. This report came up with the significant observation that hydrogen ion concentration (pH) is a dominant factor in solvent extraction reactions, and showed how numerous metals such as uranium, iron, copper and aluminum in a common solution could be made to drop out into a solvent preferentially by variation of the pH value. In effect this principle points out an amazing possibility that solvent extraction processes may some day be used to separate a whole spectrum of elements from complex

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LADIES AT AMC (front left to right) Mmes. J. E. Wilson, Oscar Friendly, A. V. Watkins; (rear left to right) Mmes. L. C. Campbell, A. H. Shoemaker, and Howard J. Young.

solution by controlling the pH value of the process.

A paper on "Uranium Tetrafluoride Production in Uranium Mills," by R. S. Long, D. A. Ellis and J. E. Magner of Dow Chemical Co. described a method by which mills which now produce yellow cake for the atomic energy program could go one step farther and actually produce green salt (uranium hexafluoride.) The process involves two-stage solvent extraction in which the uranium is first removed from sulphate solution by cation exchange, then the stripped solution goes through a second anion-exchange circuit which yields the UF_4 precipitate.

Undoubtedly many an old-time millman who walked into the session and heard the free use of such terms as extractants, eluants, and di-2-ethylhexyl phosphoric acid, wondered whether or not he had wandered into the wrong convention. But there was no mass exodus, and one cyanide man said that if the liquid-liquid extraction process were as simple as it sounded, he would buy himself a couple of pickle barrels and set himself up as a uranium miller.

In a second milling session chairmanned by Norman Weiss of American Smelting & Refining Co.'s Salt Lake operations, P. L. Stavenger and V. R. Reynolds of Dorr-Oliver, Inc. described application of the Dutch State Mines screen for separations in the 8- to 100-mesh range. The DSM screen has been found particularly useful in heavy-media circuits for draining. Good results have been achieved with a 0.020-in. bar spacing in the concentration of coal, potash and taconite.

Bacteria can be used to concentrate manganese from certain ores according to a paper presented by E. C. Perkins and Frank Novielli of the U. S. Bureau of Mines station at Boulder City, Nev. Early experiments yielded extraction as high as 99%. Preliminary cost estimates show that metallurgical-grade manganese can be produced for less than one dollar per unit from 4% manganese ore.

A solar furnace capable of developing temperatures higher than 5,000-deg F was described by W. M. Tuddenham and R. E. Lewis of Kennecott's Salt Lake City research laboratory. Mention was made of a 1000-kw unit being built in France which will compete economically with furnaces run by hydroelectric power.

Several gas-solids contacting processes for the direct reduction of iron ore were described by H. S. Turner, research and development engineer for Jones & Laughlin Steel Corp. Methods discussed included (1) the Madaras process that operates batch with respect to solids and continuous with respect to gas, (2) the Wiberg process that is continuous in both respects, and (3) the two rotary kiln processes, Krupp-Renn and R-N. Turner predicted that during the next decade these new processes would open many new doors in the Western Hemisphere to the economic use of reserves of fuels and ores.

Underground Mining

Application of the Cryderman shaft mucker in sinking the 55-deg incline Page shaft near Kellogg, Idaho, resulted in a saving of 4.92 man hours per foot of shaft, according to T. M. Tower, superintendent, and C. J. Ward, assistant superintendent, AS&R Co., Wallace, Idaho. Average advance per day (two-shift basis) by mechanical mucking was 3.38 ft, and 2.68 by hand mucking. Figures for average advance per manshift are 0.44 ft and 0.34 ft, respectively.

In discussing underground loaders used in trackless mining C. O. Dale, assistant general manager, Eagle-Picher Co., Miami, Okla., presented cost data covering operation of different units, including a new type rubber-tired end loader in a mine at Shullsburg, Wis. He stated that diesel loading costs in his company's Tri-State mines for 1956 amounted to $0.382 per ton, while that at Blue Goose mine was $0.297. For the new loader mentioned the figure is $0.152. E. P. Reed of CF&I followed with interesting discussion.

E. C. Skinner, resident manager, IM&C Co., Carlsbad, N. M., discussed operating experience with steel cable-supported conveyors for handling langbeinite ore underground. The company purchased a 1000-ft rope belt capable of being extended to 2500 ft and installed the initial 540-ft flight in January 1957. Suspension ropes are ¾ in., with rope spreaders placed on alternate 16-ft centers. The belt is 42 in. wide and travels 350 fpm. Power is provided by a 75-hp motor through a 24-in. snub-bed drive arrangement. The belt operates on a 4- to 5% downgrade to the raise. One of the primary objectives of the installation was to keep the shuttle car haul to a minimum and to eliminate complete use of trolley. It has made possible a reduction of cars operating from 5 to 2 or 3, and an increase in the number of tons per shift about 35% over former operation on the part of the face production crew. Since installation the belt has handled more than 500,000 tons of ore without showing signs of wear.

During his talk on plastic ducts for mine ventilation, J. J. Daly, engineer, Minerva Oil Co., Rosiclare, Ill., stated that at the company's fluorspar mine in Hardin County a two-man crew can now fabricate the 54-in. polyethylene film duct at a cost per foot of $0.96. Installation cost is $0.38 per foot.

Open Pit Mining

Design and operation of heavy belt conveyors and current trends were analyzed in papers presented by E. H. Mulligan, senior engineer, Steep Rock Mines, Ltd.; Arthur Arguedas, Raybestos-Manhattan, Inc.; and Martin Vander Laan, manager operations, Hewitt-Robins. Mr. Mulligan explained the belt conveyor system installed at the Hogarth Mine in northwestern Ontario designed to handle 2.5-million tons of ore during the shipping season which averages 160 days. Belts are 36 in. wide and operate at 550 fpm. All prime movers are squirrel cage motors rated at 250 hp, at 870

(*Continued on p 168*)

New Controls Cut Costly Downtime On Crushers and Grinding Mills

H. A. WRIGHT

"CAN A CONTROL BE DESIGNED to reduce downtime of crushers and grinding mills?" The answer is "Yes." At small additional cost a few features can be added to standard control equipment to cut downtime. Reviewing the operating conditions of first a crusher and then a grinding mill will help to illustrate this point.

Controls for crushers. Control of primary crushers is probably the most difficult because of severe load fluctuations. Furthermore, if the crusher stops without warning someone must dig out the ore before the motor can be restarted unless the crusher is equipped with hydraulic means of raising the mantle or cone for unloading.

Specially designed motors for gyratory crushers have a high starting torque and adequate running torque to handle maximum peak loads. Usually, wound rotor motors are used for primary crushers to permit smooth acceleration and at the same time limit starting current to a value that minimizes voltage dip.

Rotor leads are connected to a resistance bank, and acceleration of the motor is accomplished by shorting out this resistance progressively until rotor terminals are shorted.

Feed is dumped into the primary crusher in loads varying from five to twenty tons. The medium size feed, which drops into the crushing chamber, requires from 60- to 90% of the motor horsepower output. In addition, the crushing chamber may contain a number of pieces nearing maximum allowable size. When the head first begins to nip or crush these pieces, and at the same time crushes the finer stone, peak momentary loads of 150- to 200% of the motor horsepower may be experienced, even though the average horsepower required for crushing the entire load may be 50- to 75% of the motor rating. When running idle or lightly loaded, which is normal between loads, the crusher may only draw 20- to 30% of the motor rating. These wide load fluctuations make it difficult to provide adequate overload protection.

Overload protection. The motor load has wide swings, yet the average load is but 50%. The heating curve of the overload relay itself does not follow the heating curve of the motor on intermittent loads because of the great difference in mass. In some cases, overload relay heaters picked from a table for the motor are replaced by the next size heater and the control will not trip on the load swings. Because of these oversize heaters the motor will burn out before the relay will trip.

If the operator has a warning that the load is approaching the relay trip value, he will have enough time to run the existing load through before shutting down to check. It is recommended that two separate sets of thermal overload relays operating in the secondaries of a common set of current transformers furnish motor overload protection. See accompanying control circuit. Extreme voltage fluctuations and total loss of voltage can cause the motor to shut down or stall under loads. This condition is aggravated because the crusher plant is usually at the end of the line where fluctuations are greatest.

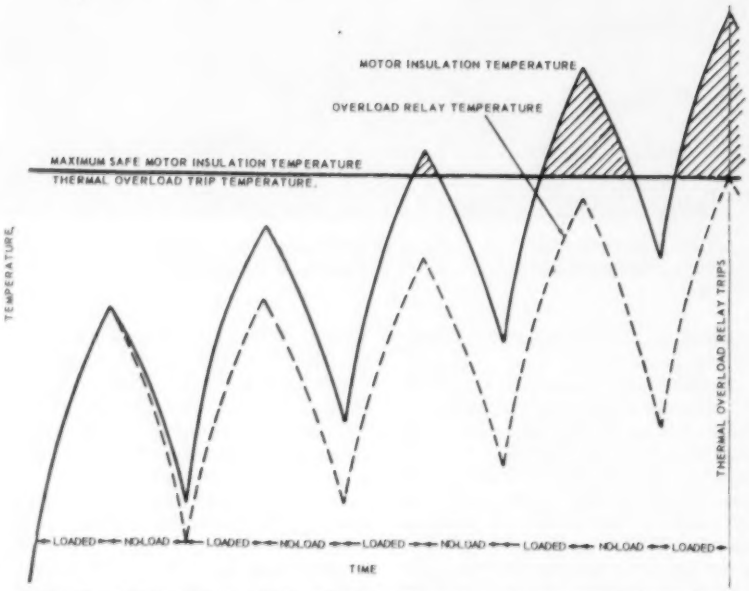
Driving motors will be shut down by the motor controller on low voltage conditions as well as complete voltage outages. The motor controller requires about 75- to 85% of rated line voltage for satisfactory operation.

Dips in voltage impose an additional burden on contacts because contact pressure may be momentarily lowered at the instant high current is drawn. If the motor stops when a full load has just been dumped into the crusher, it means that the load must be emptied again before production can be resumed.

Since voltage dips are almost impossible to eliminate, the control should be designed to operate over a wider than normal voltage range. Because the drop-out point of a dc contactor is normally much lower than a similar size ac contactor, it is wise to use dc on larger contactors.

Undervoltage protection. With undervoltage protection on a motor the controller will drop open, shutting down the motor when there is a loss of voltage. By using a relay having a time delay drop-out, the control even though it drops open may reestablish itself if the voltage returns within the setting of the time delay undervoltage relay.

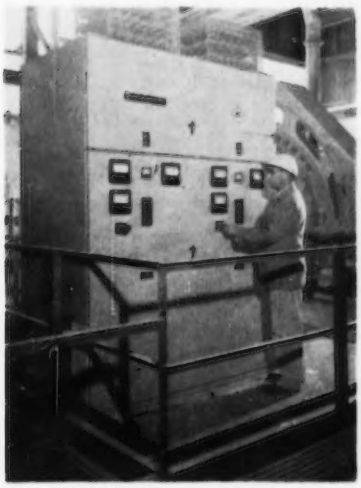
Therefore, stalling of the crusher on loss of voltage can often be prevented if voltage is restored before the motor drops to 50% speed. Con-



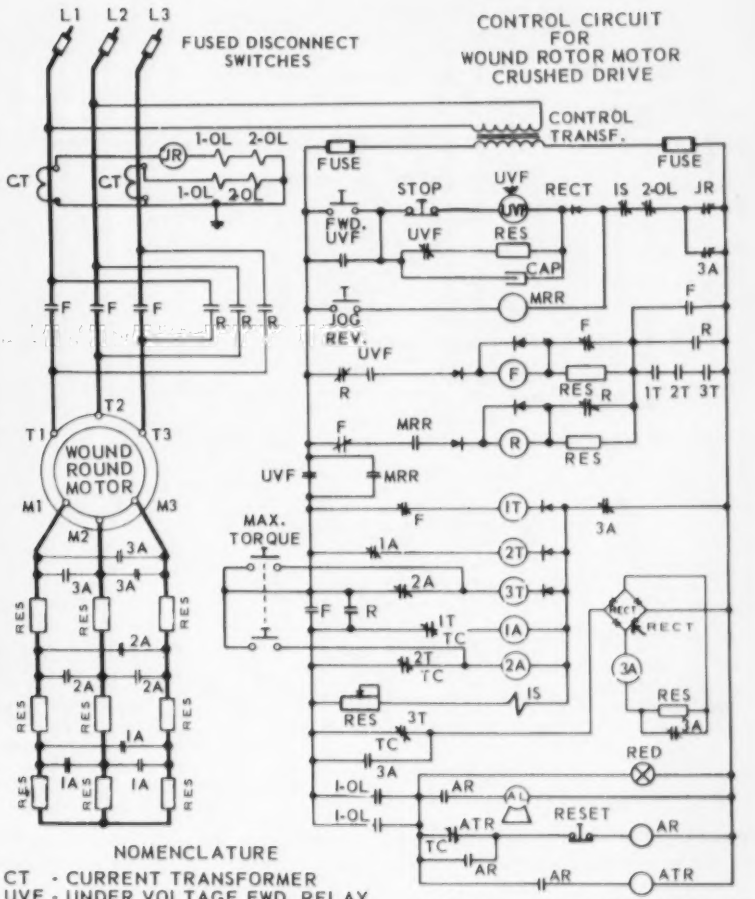
WITH INTERMITTENT CRUSHER LOADS such as these, normal thermal overload relays may fail to give complete protection. See text below for a good protective method.

Mr. Wright is assistant manager of sales of the Control Dept., Allis-Chalmers Mfg. Co., Milwaukee, Wis.

ELECTRICAL EQUIPMENT on gyratory crushers must withstand shock loads caused by intermittent truck dumping.



WHEN A GRINDING MILL starts up, torque variations are sufficient to require special starter controls such as this unit for 1000-hp ball mills.



NOMENCLATURE

CT - CURRENT TRANSFORMER
UVF - UNDER VOLTAGE FWD. RELAY
MRR - MASTER REV. RELAY
JR - JAM RELAY
IS - INCOMPLETE SEQUENCE RELAY
AR - ALARM RELAY
ATR - ALARM TIMING RELAY
T - ACCELERATING TIMING RELAY
A - ACCELERATING TIMING RELAY
AL - ALARM DEVICE
TC - TIME CLOSING CONTRACT
RECT - RECTIFIER
RES - RESISTOR
F - FWD. LINE SWITCH
R - REV. LINE SWITCH

How This Circuit Protects The Crusher

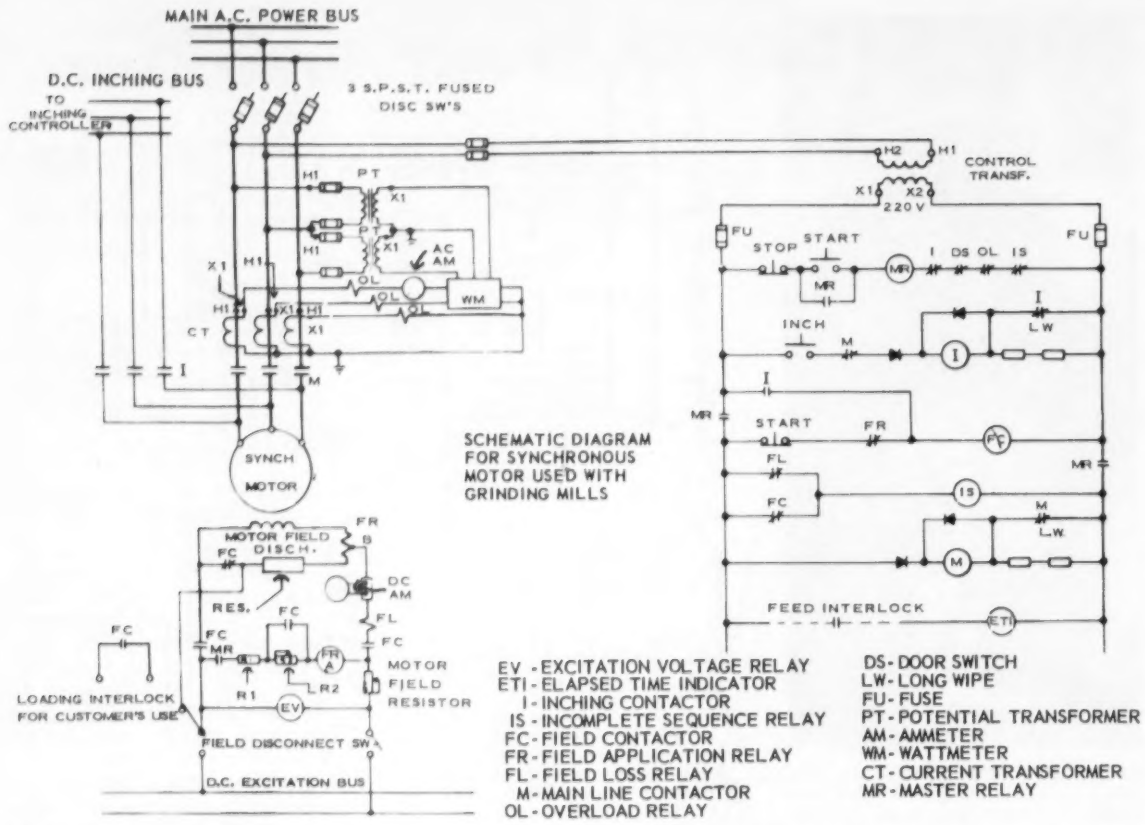
One set of relays 1-OL is selected to operate on slight overload conditions. Relays have normally open contacts and are of the automatic reset type. When these relays operate, a remote alarm horn and indicating light are energized to indicate that an overload condition has been reached; they do not stop the motor. An alarm control relay (AR) and an alarm timing relay (ATR) are used to set up the alarm reset circuit. When the alarm horn has been energized, it can be de-energized by means of a reset button. The indicating lamp remains energized until the overload relay is reset. However, if the motor continues to be overloaded after the alarm relay has been reset, the timing relay (ATR) will re-energize the horn after a definite time delay. The horn must then be reset and the cycle will continue until the overload condition has been corrected.

A second set of thermal overload relays (2-OL) has normally closed contacts that are manually reset. These relays operate when the motor temperature has reached the danger point, which may happen if the operator has not heeded the alarm warnings. Operation of the (2-OL) relays will stop the motor.

troller can be provided with an arrangement that will automatically restart on recovery of voltage if it should occur within a preset time.

Stall protection. Current relay (JR) operates on excessive line currents to stop the motor instantly, thus providing stall or jam protection. This relay, being adjustable, is set so that it does not operate on normal load peaks but only when the current exceeds these peaks, such as would be the case when the motor approaches the stalling point. During motor acceleration this relay is by-passed to allow the motor to be started. This relay will not protect the crusher from damage due to a stall caused by a shovel tooth in the crusher feed.

Automatic control best. Automatic control of the wound rotor motor is recommended over manual control. Quite often operators tend to "tease" the drum, which results in excessive



PROTECTIVE FEATURES to reduce downtime on this synchronous-motor control circuit for grinding mills are described on pp 97 and 98. Use of three overload relays (OL) instead of the customary two prevents motor burn-outs.

contact erosion and subsequent maintenance.

The resistors used with these controllers should be Class 145 for heavy duty starting and should be enclosed in order to protect them from mechanical damage.

Acceleration protection. The thermal type relay (IS) is energized continuously throughout the motor accelerating period and job-reverse operation. The relay becomes de-energized when the motor has been connected to the final accelerating step. If the motor operates excessively on the accelerating speed points, or if too frequent starting occurs, the relay operates to shut down the motor. The incomplete sequence device protects the starting resistors and provides additional thermal protection for the motor.

Accelerating contactors. If intermediate accelerating contactors are de-energized after the final normal speed accelerating contactor has closed, unnecessary maintenance caused by continued closing of intermediate contactors may be eliminated.

Maximum torque starts. At some resistance, setting a wound rotor motor will have maximum torque. By applying maximum torque on a stalled crusher the crusher can sometimes be started and the jam cleared. If the motor fails to start when energized because of jammed load, pressing the maximum torque push button will close the secondary contactor (2A) giving the correct amount of secondary resistance for maximum starting torque. The normal timing sequence is prevented from going beyond this point while the maximum torque button is depressed. When the button is released the controller continues its normal starting sequence.

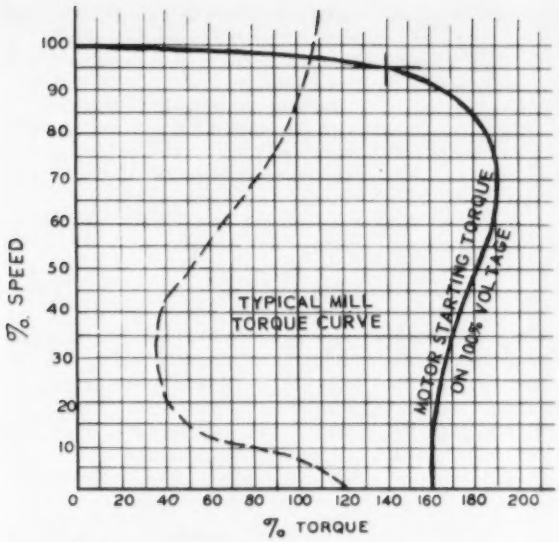
Reversing controllers. If the crusher stalls because of jamming and cannot be restarted in the forward direction even by use of maximum torque, the jammed load may possibly be relieved by operating the crusher momentarily in reverse with maximum torque. This should be a "jog" reverse only, since it is not desirable to operate the crusher continuously in reverse for fear of loosening the head nut at the top of the crusher mantle.

Short-circuit protection. Fault currents experienced during a line-to-ground or line-to-line short circuit are greater than the capability of line connectors used in industrial control to interrupt this fault current. Therefore short-circuit protection must be provided.

Circuit breakers or current-limiting fuses may be used to protect controllers in the 600 class.

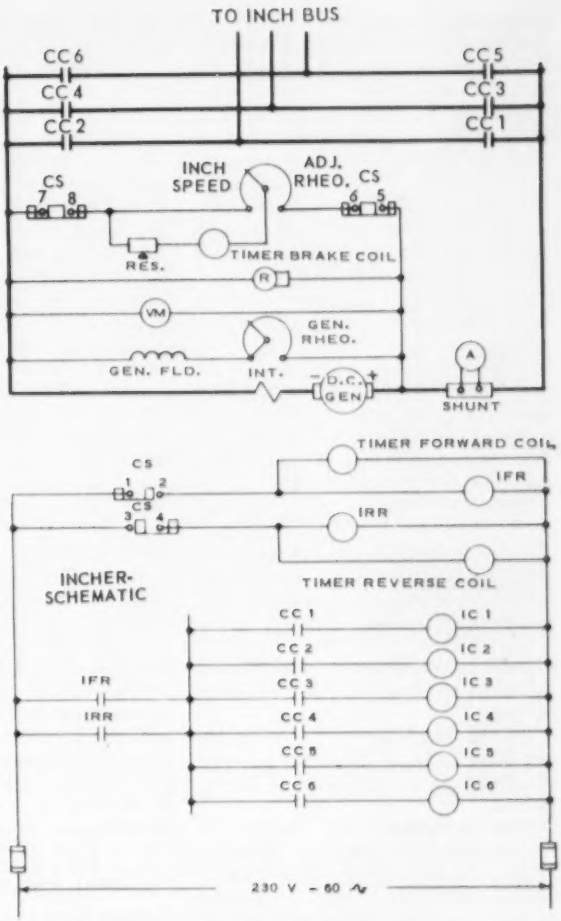
Controllers in the 2300 and 5000 class on the other hand may not be protected by a back-up breaker. If the fault capacity of the line is below 50,000 kva the starting switch may be used as the short-circuit protective device by the addition of over-current relays. If the fault capacity of the line is greater than 50,000 kva, current-limiting fuses must be used. If the short is on the phase supplying the holding coil of the contactor, the sealing power of the magnet is lost and the contactor will drop open in approximately 4½ cycles.

High-speed back-up breakers are considered fast if they are of the eight-cycle variety, and are normally set somewhat higher. In other words, there is a zone from the time that the contactor drops (4½ cycles) to the time that the back-up breaker opens (8 to 20 cycles) when the contactor is severely arcing internally. High-capacity high-speed fuses were developed to provide the protection



▲ High-Torque Starting

CONTRARY TO COMMON BELIEF, grinding mills do not develop strictly constant-torque loads. The speed-torque above shows that a grinding mill requires a high starting torque. This torque falls off immediately after starting and during acceleration. At about 10- to 30% speed, torque begins to increase, and at about 85% speed the torque requirements can be greater than normal running torque. Thus, the motor torque must be sufficient to start and synchronize the mill load and also provide excess torque during the acceleration period, during which full speed is attained in about eight to ten seconds. See text below for description of an effective control circuit to provide safe high-torque starting, also diagram of such a control circuit on opposite page.



Inching Controls for Mills ▶

THIS CONTROL CIRCUIT enables an operator to rotate a grinding mill slowly (inch the mill), either forward or in reverse, while charging balls or rods, or replacing mill liners. Power from the ac bus to the synchronous motor rotor (in diagram on opposite page) is cut off and replaced with dc power from a dc inching bus. Note that controlled current passing through inching bus in this diagram goes to inching bus feeding synchronous motor rotor on opposite page.

1C1 thru 1C6 – Inching Contactors
CC1 thru CC6 – Inching Timer Commutating Contacts
CS – Control Switch
VM – DC Voltmeter
A – DC Ammeter
IFR – Inch Forward Relay
IRR – Inch Reverse Relay
R – Red Indicating Lamp

Timer Forward Coil) Timer Motor
Timer Reverse Coil) Driving Commutating Contacts

that could not be provided by circuit breakers. Fuses are designed to blow in less than ½ cycle, which is considerably less than the 4½-cycle drop-out time of the contactor. It is for this reason that high voltage fused starters have found such wide application and acceptance.

Damage by dust. Severe dust conditions are always present in a crusher plant. Because of the importance of this equipment a dust-tight (NEMA V) enclosure is suggested. Neoprene gaskets should be specified instead of felt gaskets, because felt absorbs rock dust and moisture. Even with a NEMA V enclosure the control should be blown out about once a week with compressed air to prevent minute rock particles that have passed the gasket as a result of temperature changes from insulating the control contacts.

Controls for Mills

Grinding mills. Grinding mills usually require a base load, and therefore larger mills nearly always use synchronous motors. Grinding mill loads are considered representative of constant-torque loads, although the speed-torque curve (see illustration) demonstrates that this is not strictly true. A grinding mill requires a very high starting-torque, with torque falling off immediately after starting and during acceleration. At about 10- to 30% speed torque begins to increase, and at about 85% speed the torque requirement can be greater than normal running torque. As a result, a motor must be applied that has torque to start and synchronize the mill load and still have sufficient excess torque during the acceleration period to reach full speed within from 8 to 10 sec.

Grinding mills often present one of the most difficult of all starting problems imposed on synchronous motors. This is especially true where mills have been shut down over a weekend and/or the ambient temperature is low.

If a synchronous motor is directly coupled to the mill, it must have at least 150- to 200% starting torque, and 120- to 150% pull-in torque. (See illustration). This wide range in starting and pull-in torque results from line voltage dips which usually occur

during the starting period, and also upon prelubrication of mill bearings.

Since mill motors are often in the 1000-hp class, power systems allow full-voltage starting. Therefore, some form of starting must be used in such instances that will limit the starting kva. Special motors with high starting torque and low starting-current characteristics can be used in such cases. Or a standard synchronous motor with at least 175% pull-out torque can be used with a magnetic clutch. It is then possible to start the motor without load at reduced voltage, bring it up to speed, and engage the clutch.

A well designed motor should have a capability of two successive starts followed by a third after twenty minutes then a 60-minute rest or four times per hour with at least a 15-minute wait between starts followed by a 60-minute rest.

Another item of importance to the user is how long will the motor stand locked rotor current without damaging the cage bars.

(a) On directly coupled motors the allowable time operating at zero speed is from 5 to 10 sec, and at 95% speed 60 sec.

(b) On clutch drives the allowable operating time at zero speed would be 10 to 20 sec and at 95% speed 60 sec.

Dust protection. The control for the grinding mills may be mounted adjacent to the mills or in a separate control room in dust tight enclosures. In any case, the equipment should be periodically cleaned with compressed air to avoid more time-consuming maintenance.

Three overload relays. If the starter is supplied from a wye-delta or delta-wye transformer bank, three overload relays should be used rather than two which are standard. Otherwise if a fuse blows in one of the primary leads, one of the secondary leads will carry twice the normal current and the motor will burn out. Three overload relays will also give more positive protection under extreme dust conditions. See illustration.

Auxiliary contact on field contactor. An extra, normally open, contactor on the field contactor should be available if a clutch is used to connect the load. This closes when the field is applied and may be used to start feed to the mill after it is up to speed.

Excitation source. The following are items to look for when specifying a dc source for the synchronous motor field:

(a) Field knife switch to open field circuit to facilitate maintenance even though the dc bus is hot (should be required on 250 dc).

(b) Dc undervoltage relay—used when knife switch is used to prevent operator from starting mill with no excitation.

(c) Fixed tap motor field resistor. (Also required when using a clutch supplied from excitation source).

Time delay undervoltage. Time delay undervoltage protection is a standard feature on high-voltage synchronous motor starters. However, as a general rule it is not recommended for grinding mills because instantaneous undervoltage protection is provided by the inherent characteristics of the control devices.

Time delay undervoltage protection permits the motor to be restarted automatically after a momentary loss of voltage. From an operating standpoint this feature is desirable. However, the following problems may arise where more than one mill is operated from the same electrical distribution feeder.

(a) Loss of voltage will cause all synchronous motors to pull out of stop and slow down.

(b) If normal voltage returns within the setting of time-delay undervoltage relay, all motors will try to start and resynchronize at the same time.

With all the motors drawing high currents, the substation may not have sufficient capacity to permit resynchronizing. The squirrel cage protective relay will then shut the motor down. In the process, the motors have been unnecessarily overheated.

Field Failure Protection

Field failure. Field failure protection will shut down a motor on loss of dc field current. It should be used on large synchronous motors as it gives additional protection, particularly to the squirrel cage starting winding, at a small increase in price. For example, should the motor field open circuit due to breaking slip-ring brushes, a burned-out field coil, or any other cause, the pull-out protection offered by the field application and removal relay is lost due to the open circuit, and field failure protection is necessary.

The field failure relay may be connected for:

(a) Instantaneous shut down on loss of field if time-delay UV protection is not furnished. With this arrangement, re-synchronizing after pull-out is not possible, and the motor must be restarted. During starting, a timing relay by-passes the field failure relay contact until the field has been applied.

(b) Time delay shut-down on loss of field. To permit starting, or re-synchronizing after pull-out when possible, a timing relay is used which delays shut-down for about 10 sec when operating without field on the motor. This permits the mill to ride through voltage fluctuations and resynchronize after pull-out. This method should not be used if there is a possibility that the motor may stall (come to rest).

Inching control. Dc inching control is recommended for spotting the mill during relining and/or re-charging if other means (as follows) are not provided.

(a) Clutch (slipping the clutch of course increases clutch maintenance).

(b) Removing the mill shell and heads to repair bay with a crane.

The incher control electrically provides commutated direct current, resulting in slow-motion high-torque rotation of the synchronous motor. An adjustable, motor-driven, timing-cam controls the sequence of closing and opening the 6 dc line contactors. The direct current is thereby converted into an approximate 3-phase alternating current.

To inch the mill the motor is disconnected from the power line by depressing the stop button. The dc generator for inching power is started. The inching control is turned to inch forward. (Direction of rotation when running normally.) Then pressing the inch pushbutton connects the starter to the inch bus. An interlock on the inch contactor closes the field contactor applying dc to the rotor.

The rotor of the motor then moves along with the corresponding slowly moving electro-magnetic poles set up in the starter. The rate of inching can be controlled by adjusting the speed of the timer motor-driving the commutating cam.

An inch "reverse" is available to the operator, but should be used only in emergency unless so advised by the mill builder.

Transfer switch. In order to inch a synchronous motor it is necessary to disconnect the primary from the high voltage bus and transfer it to an inching bus. A three pole double throw high voltage transfer switch may be used. The first cost of this arrangement is considerably less than an automatic transfer system. However, a switch may not accomplish the desired result. For example, most plants have a rule that only electricians may throw high voltage disconnect switches.

Using an automatic throw-over arrangement with two high-voltage air contactors must be interlocked mechanically. The pushbutton station on the starter or at the operators position will have "start", "stop" and "inch" buttons. It is then only necessary to stop the mill, turn the inching conroller to "forward" and hold the "inch" button down. This rotates the mill at approximately 1/360th of normal speed and permits accurate positioning.

BEFORE attaching the zinc anodes, steel corroded and nuts and bolts dissolved in the leach liquor.

AFTER adding the anodes, the thickeners were used for eight months without sign of costly corrosion.

How Zinc Anodes Can Reduce Galvanic Corrosion in Zinc Plant Thickeners

ZINC DEPARTMENT of Consolidated Mining & Smelting Co. of Canada Ltd., Trail, B. C., is using one of its own products to protect its process equipment from corrosion. Zinc in the form of galvanic anodes is used to cathodically protect the steel members of the zinc leaching plant thickeners from corrosion.

In one of the zinc department's leaching plants 15 large thickeners are used to clarify zinc sulphate feed solution for the electrolytic zinc cells. Thickeners are wooden construction with steel rake arms. Wooden arms were used at one time but were replaced with the stronger, more trouble-free steel arms.

In recent years, solution has become more corrosive and replacement of the rake arms has been more frequent. This excessive corrosion has now been remedied by applying cathodic protection, using galvanic zinc anodes which give 100% protection from corrosion, and prolongs the useful life of the steel rake arms indefinitely.

Thickener feed is a slurry of unleached zinc oxide and ferric hydroxide in a solution containing about 24% zinc sulphate, together with trace amounts of other elements, including copper. The pH of the solution, is 5.3 and the temperature is about 40 deg F. Thickeners remove most of the solids from solution prior to its being purified, filtered and pumped to the electrolytic tank room.

Each thickener is a 30-, 40-, or 50-ft dia wooden stave tank with a centrally suspended timber shaft from which extend four (two short and two long) mild steel rake arms. Corrosion rate of the mild steel arms, blades, angles, nuts and bolts and other members was such that extensive maintenance was necessary about every six months, and the entire steel assembly had to be replaced every year or two. It has been found that by fastening zinc anodes to the rake arms, corrosion of the steel can be completely eliminated.

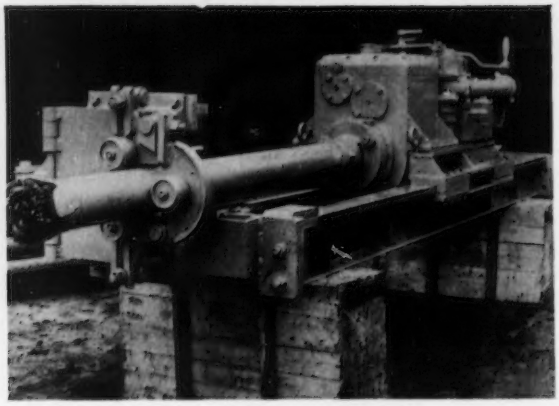
In the case of a 40-ft dia thickener, ten zinc anodes are fastened to the rake arms, three anodes to each 18-ft arm and two each to each 11-ft arm. Each zinc anode measures 3x3 in. by 2 ft and weighs approximately 45 lb. Attachment to the rake arms is by bolting through special inserts cast into the anodes.

Anodes are insulated from direct contact with the steel by a wooden insert, electrical contact from zinc to steel being made through the bolts. Zinc anodes are cast from Tadanac Special High Grade (99.99% Zn).

Experience has shown that complete protection of the steel is achieved by the use of galvanic zinc anodes. Zinc consumption is about one lb per day (for a 40-ft thickener) or about 2 lb per sq ft of protected steel surface per year. Since the thickeners are shut down at approximately yearly intervals for inspection and preventive maintenance, the zinc anode system is designed for a life of about 14 months and the anodes are replaced at the time of the shut down.

For a 40-ft thickener, the cost of the anodes, including installation at $25 labor charge, is estimated to be $100. Cost of replacing the steel rake arms would be around $700. Thus, for all 15 thickeners, through the use of $100 worth of zinc and labor, an annual saving of more than $4,000 is achieved, plus elimination of expensive shut downs due to unexpected equipment failure.

Credit for the idea must go to T. A. Rice, superintendent leaching plants; A. C. Harkness, former assistant research engineer; J. H. Nicholson, assistant superintendent of development; J. R. Wellington and W. L. M. Phillips, research engineers.



CUTTING DEVICE on Nuesser & Graefer machine consists of tricone roller bit and reamers. Hardfaced ribs between reamers maintain alignment. Non-rotating four-runner skid is used between 8 to 10 rod sections for support.

German Boring Units Speed Raising

RAISE BORING DEVICES are commanding considerable attention in Germany. They are capable of driving inclined and vertical openings up to 5 ft in dia and several hundred feet long. So far their use has been confined to hard sedimentary or softer rock.

Although they have played a major role in some spectacular mine rescues they are actually designed as competitively economic development machines. Two units described below employ roller bits. One is like a reamer bit made by Hughes Tool Co. (AIME, New Orleans, 1957) for large down holes, and since it is pushed ahead, it requires no preliminary bore hole. Neither produces a core although the other is similar to the American Zeni shaft borer (*E&MJ* Mid-June, 1956). It requires a preliminary drill hole for a towing cable.

TYPICAL BORE in this case is made by Bade's Bohrwolf.

A third unit, described below, employs single tungsten carbide prongs to cut a large core like a small drag core bit. It uses an advance bore hole at the periphery of final bore for rotating motor and tow rope.

Details of the three units were given to *E&MJ* by the manufacturers through McGraw-Hill's World News Bureau in Bonn.

Nuesser & Graefer

Roller-cone type bits are used to make a Christmas-tree or cone-like assembly which reams out a bore up to 525 ft long and 32 in. in dia following a slightly advanced pilot hole. This unit, shown above, is made by Nuesser & Graefer KG., Sprockhoevel.

Machine is powered by an 18-hp pneumatic motor with a sliding change gear that gives a speed range of 40 to 70 rpm. Pressure and feed are transmitted by two racks and pinions, driven by a 6-hp pneumatic motor. Both motors are mounted on a sliding carriage.

Compressed air is the ideal driving medium in spite of high costs because it can be regulated easily and does not overburden the motor. Separate control mechanisms for rotation and feed provide the basis for the use of roller bits, for the number of revolutions and pressure have to be adapted to rock hardness and the weight of the borer which increases with hole length.

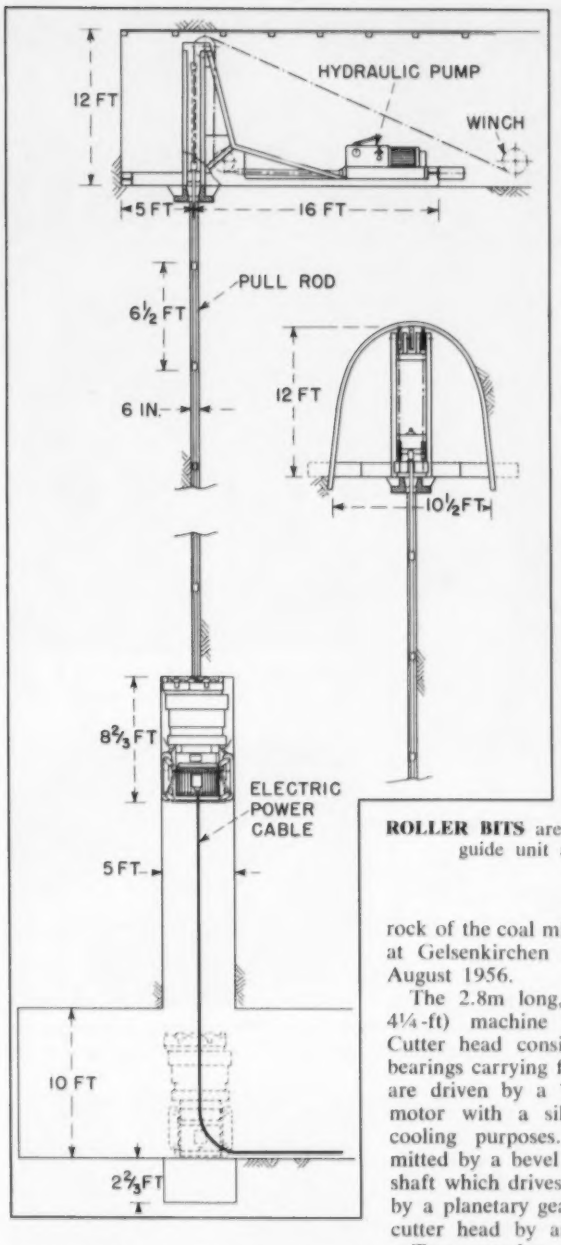
Rod length is 1.5m (5 ft), diameter is 114mm (4½ in.) and weight is 45 kg (100 lb) each. Rods contain a back-pressure valve to prevent flowback of flushing water. As roller bits have tendency to adjust themselves square to rock bedding planes and strata, new ways had to be found to insure alignment. Sight bore poles (i.e. pilot bit rods) have been developed that carry four longitudinal ridges with hard alloy facing and same diameter as bit. Three or four of these "poles" are placed just behind bit, followed by the normal bore rod. The new construction, combined with certain operating experience, makes close alignment possible.

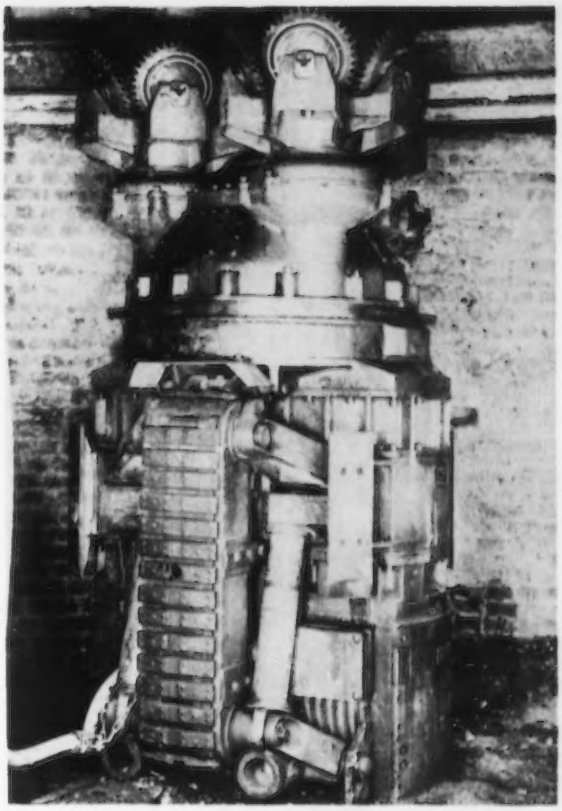
Unlike oil well drilling, the technique of up-boring permits only a minimum of clearing liquid to be used for removal of cuttings and cooling. Water at 200 to 300 liters (50 to 80 gal) per minute under pressure of up to 30 atm (450 psi) is necessary and is used in continuous recirculation.

After fixing the machine on a concrete foundation, the boring process starts with sight boring, using a 143mm (5⅝ in.) dia roller bit on a sight bore pole. When sight boring is completed the bit is taken off and a widening bit combination of 270mm dia is fixed on the rods. The bore hole is subsequently widened by using a series of progressively larger bits up to 813mm (32 in.).

To prevent lateral vibrations of the bore rods, iron guides are installed between every eight or ten poles. These guides do not rotate and consist of replaceable four-runner skids fixed on a "freewheeling" slide that is threaded onto a bore pole. Wobbling movements when the bit cuts a rock stratum of different hardness can be avoided by using two widening bit combinations—for instance, 270 and 406mm dia—at the same time.

Five life-saving bores have been





ROLLER BITS are also used on Bade's unit for cutting element. Crawler treads guide unit and prevent rotation and hydraulic pump applies pull.

reported—four in Germany, one in Holland. Openings were in sandstone, slate and coal. In May 1955 two German miners were freed by a 90m, 405mm dia hole. In same year three Dutchmen were saved with 24-in. bore. Same machine aided another rescue by cutting a 5½-in., 66½-deg up-hole, 330 ft in "hard rock" in 47½ hr to supply rations while 45-ft winze was sunk in 10 days.

Bade & Co.

Bohrwolf RL 5 of Bade & Co., Lehrte, (shown above) was developed for the potash mining industry and tried for the first time in carboniferous rock of the coal mine "Graf Bismark" at Gelsenkirchen between June and August 1956.

The 2.8m long, 1.3m dia (9¼ x 4¼-ft) machine weighs 8.3 tons. Cutter head consists of three roller bearings carrying five bits each. They are driven by a 70kw AEG-electric motor with a silicone winding for cooling purposes. Power is transmitted by a bevel gear to the driving shaft which drives each roller bearing by a planetary gearing and the whole cutter head by an inner-gearing.

Two crawler tracks are spring-pressed against the bore hole wall and guide the machine. The track springs also damp oscillations and torsional forces produced by the driving gear.

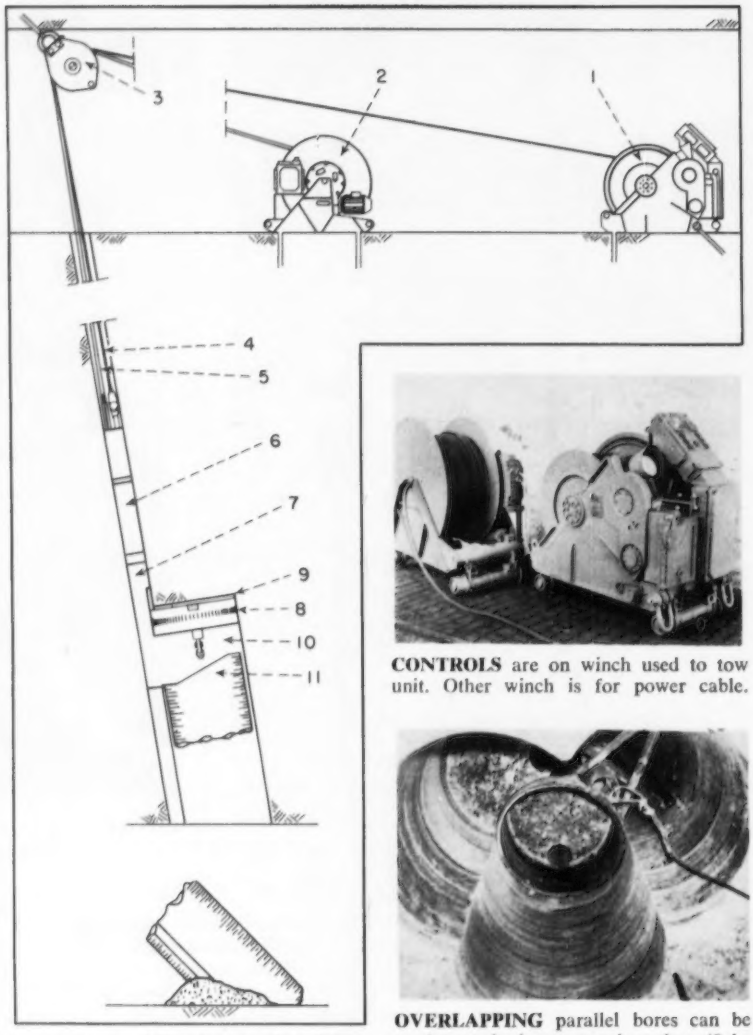
The boring machine is dragged through an advance bore hole of 150- to 270mm (6- to 9½-in.) dia, using a hydraulic dragging device which is installed at the aiming point. A 60mm dia bore rod transmits the 20- to 60-ton contact pressure that is produced by two high-pressure hydraulic pumps.

Time required for mounting the machinery was two weeks. A 21.80m long boring was obtained within five weeks. Fifteen meters of so-called "P2-sand" was perforated first, followed by a small coal vein of 0.8m and a 4m thick layer of hard slate. Average boring speed was 1.4m per hour. The P2-sand was extremely hard, with 80 to 90% quartz. The rest was sericite and chlorite. Cuttings were mostly small chips or scales with about 1/3 fine dust.

Salzgitter

A coring type drag bit unit is made by Salzgitter Maschinen AG., Salzgitter-Bad. Numbers in text below

DRAG BIT prongs cut core on Salzgitter unit as it starts opening raise.



RING bearing cutting prongs is rotated by motor in drill pipe on Salzgitter's.

CONTROLS are on winch used to tow unit. Other winch is for power cable.

OVERLAPPING parallel bores can be used to make larger openings than 49 in.

refer to schematic drawing above.

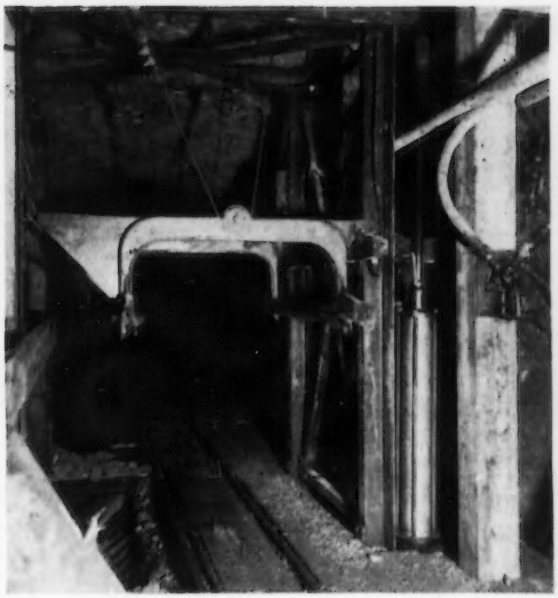
Hard metal tipped, prong-type cutter bits (9) are fitted into end of a rotating undercutting-ring (8) which is 1,000mm (39½ in.) in dia. Ring tops a cylindrical shell (10) which is rigidly fastened at tangent point to a drill-stem-like adapter (7). Adapter houses reduction gear and pinion and 15kw electric motor (6) for driving undercutter. Adapter is pulled through 235mm (9¼-in.) advance bore hole by rope (4) from winch (1). Electric power cable (5) comes from another winch (2). Both winches are electric.

Rope winch develops pull of 8,000 kg for maximum boring pressure of 7,000 kg (7.7 tons). Control instruments are at winches.

Core (11) grows until broken off by own weight and then falls. Boring speed in potash and rock salt is 10 to 13 meters per hr. Rings of 1,250mm (49 in.) can be used too.

SHELL under geared ring does not rotate.

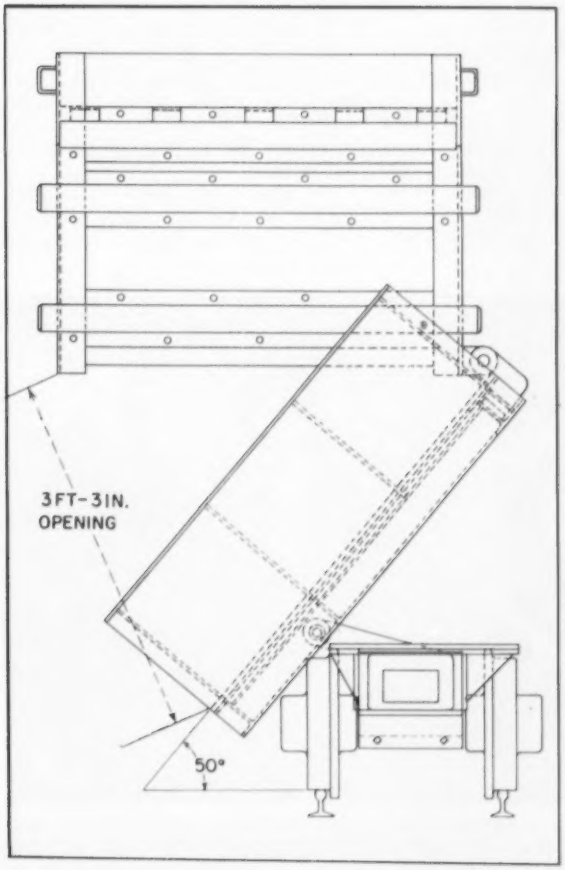
CORE breaks under own weight and falls.



TWO AIR CYLINDERS pull down on steel cables which travel over pulleys, and raise frame which lifts mine cars.

CAR CAN BE RAISED HIGH ENOUGH to produce a 70-deg dumping angle—sufficient to allow wet ores to discharge.

Light Mine Car Designed for Sticky Ore



ALPINE MINE CAR was designed to fill need for lightweight, 3-, 5- and 7-ton cars to operate over long hauls and dump at 70-deg angle. One axle of car is rubber mounted and oscillates from center to permit knee-action on uneven track. All metal to metal contacts are eliminated and car rides and hinges on rubber. This reduces noise and amount of lubrication required.

Only maintenance required on 12 cars purchased in 1946 has been wheel replacement. Mine operators in Canada and South Africa report satisfactory operation on sticky ore because of 70-deg dumping angle.

Because of dumping arrangement (see photographs) car is not for universal application. However, development work experience has shown that a temporary setup of air cylinder and hook is satisfactory for smaller 3-ton size. This device has advantage of easy removal and transfer to another location. Alternate permanent dumping arrangement consists of two air cylinders mounted one on each side of track and anchored to heavy I-beam running under track. Air pistons engage lip of car and lift to dumping position. Illustration at left shows body being raised to dumping position.

In practice, motorman can dump cars by remote cable control. Time studies show dumping Alpine cars is slower than dumping Granby-type cars. This is due to necessity to stop train to dump each car.

Under conditions for which it was designed this disadvantage is offset by advantages of high dumping angle, all-welded construction, rubber-mounted oscillating action, 3-, 5- and 7-ton capacity all operating on narrow gage track and lightweight.

Car gets its name from designer A. E. (Bert) Alpine. He is employed by Johns-Manville Corp. in the general plant engineering division at Manville, N. J. Car is patented in Canada, South Africa and United States of America. It is manufactured in Canada by E. Long Ltd. of Orillia, Ont. Illustrations are by Mr. Alpine.

ORE KNOB COPPER MINE, now operated by Appalachian Sulphides, Inc., has brought new economic life to the Blue Ridge Mountain region in northwestern North Carolina. Production started Mar. 15 and currently is 375-tpd average.

Re-opened Ore Knob Copper Is Thriving

PAY DIRT was hit just minutes before Nipissing Mines Co. Ltd., in 1954, cabled a "quit now" message to Philip Eckman and his crew of diamond drill explorers at Ore Knob, North Carolina. For geologist Eckman, the strike meant success after what had been a nearly fruitless venture; for Ore Knob, it had seemed merely another hapless mining try in the long chain of sporadic activity that had been carried on in the area since the mid-1850's.

Not so this time, for Appalachian Sulphides, Inc. (Nipissing's subsidiary), combining forces with Canadian engineers, mountainmen-turned-miners and modern equipment, is currently producing 375 tpd with year's end goal set at 800 tpd.

Three levels (560 ft, 700 ft, 840 ft) cut from the 1037-ft shaft completed in July 1956, are being worked with air power supplied from a twin installation of Atlas Copco AR-7 stationary air compressors, each delivering 1710 cu ft of air per minute at 100 lb pressures. Other equipment presently in use includes 15 stopers and 10 plug drills.

Drilling 36 holes per drift round through Ore Knob's granite gneiss country rock, Appalachian Sulphides' records show that maintenance costs on the drills averaged about ½c per ft during the first six months of work.

The nearly vertically dipping fissure vein which contains the ore is approximately 200 ft wide and 1500 ft long. Ore minerals are pyrrhotite, pyrite, and minor quantities of sphalerite, while the gangue contains biotite, albite, calcite, and many silicate minerals.

Appalachian Sulphides employs 170 men (105 of them working the pits on a two-shift day), and at present, Ore Knob, in its eighth go-around with prospectors and miners, represents an investment of nearly $2.7-million.

Ore Knob's long history began during the pre-Civil War years when, for a time, it was worked as a high-grade

DAY SHIFT waiting for trip down into mine after lunch break.

MOST OF MINE'S 105-MAN underground crew were recruited from Blue Ridge area. Shaft is at 1037 ft, with drifts at 280, 420, 560, 700, 840 and 980.

Financial Statement—Ore Knob Copper Co.—1878

(from Office of Cornell & Hildreth, New York City)

Cost of buildings, machinery, furnaces and opening of the mines, exclusive of cost of property (1,600 acres)		$265,349.00
Cost of live stock, wagons, etc		$ 10,485.00
Cost of sundry tools, etc		$ 4,785.00
		$280,619.00
Assets		
Wood in rank and at the mines		$ 10,000.00
Furnace materials (soapstone, etc.)		$ 2,240.00
Advances on wood, coal and grain		$ 2,600.00
Stock of merchandise in store, upwards of		$ 17,000.00
Mine supplies (powder, fuse, candles, etc.)		$ 2,500.00
Copper in New York and in transit, 174,629 lb, at 14.8¢	$25,845.00	
less advances	$13,111.00	$ 12,734.00
Cash in bank		$ 3,729.48
Cash at mines		$ 3,000.00
		$182,875.48
Liabilities		
Outstanding Bills (unmatured)		$ 8,461.00
Outstanding Drafts (not presented)		$ 4,309.29
Amount due for labor		$ 3,000.00
		$ 15,770.30

DRILLING into the near vertically dipping ore-bearing fissure vein, miners extract productive pyrite and pyrrhotite.

copper producer before miners lost all trace of the rich vein. Twenty years passed before S.S. and James E. Clayton, directing the Ore Knob Copper Co., began a 10-yr operation that produced nearly 25-million lb of copper and made Ore Knob one of the nation's greatest copper mines. Company's first ore extractions (oxide and black copper) were hauled to Marion, N. C., or Wytheville, Va., the nearest railroad points. Hunt and Douglass process was tried for a time, but eventually the firm erected two reducing furnaces and a refining furnace, using charcoal as fuel.

In May 1881, Prof. Thomas Egleston of the School of Mines, New York City, outlined the Ore Knob Copper's process as follows: (1) roasting the sorted ore and dressed fines; (2) fusion in a shaft furnace for mattes, generally called single mattes; (3) roasting the mattes in piles; (4) fusion in a shaft furnace for black or double matte; (5) treatment of the salamanders; and (6) refining.

Cost per lb of copper produced during this period (1879-80) was 10.4c but, just as suddenly as before, the Claytons, in 1883, were forced to end their mining activities when lode seemed exhausted.

In 1896, the No. 2 South shaft was deepened 30 ft and several carloads of hand-sorted slag ($10,000 net value) were shipped from the northern slag dump to end Ore Knob's nineteenth century history.

Early twentieth century developments at the mine were limited to a single carload shipment in 1913 (12.90 oz of gold, 112.11 oz of silver and 14,672 lb of copper), minor activities during World War I, and unsuccessful shaft-reopening operations undertaken in 1927 and subsequently closed for the same reasons.

U. S. Bureau of Mines began a project in 1942 which it hoped would inaugurate a rebirth of major mining activity in the area. Project was, however, short-lived and the Bureau abandoned Ore Knob the very next year.

Mining area had been untouched for 11 years when Philip Eckman arrived in 1954 to lay the foundations for Appalachian Sulphides' present successful operations.

Sonoma Quicksilver Starts Shipping

NEW PRODUCTION and new life for an old mine are possible when a mining company exercises expert examination and follows it up with equally careful development—and Sonoma Quicksilver Mines, Inc., of Guerneville, Calif. are proving it.

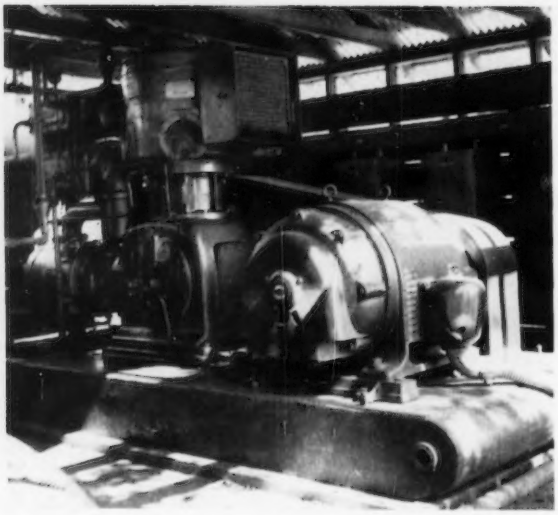
Sonoma, under R. S. Smith, company president, is again producing from the Mount Jackson and Great Eastern quicksilver mines in Sonoma County, after a brief shutdown. Downtime was devoted to planning development and modernization, now under way. Some 80 to 90 tpd ore, containing 7-lb Hg, are handled from the furnace operation which started up again June 19, 1957 and was put on continuous service.

Bulk of ore treated is obtained from development headings as Sonoma reaches out in a mine that was originally opened in 1875.

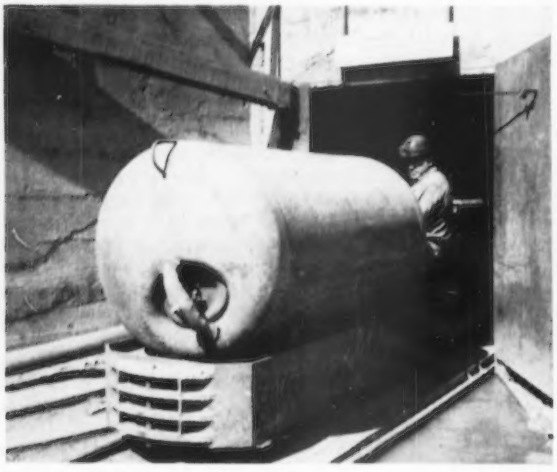
Principal development activities in progress include sinking the main shaft from the lowest level, the 975, to the 1200-ft horizon, with shaft stations to be established at 1083 ft and 1200 ft preparatory to lateral work; diamond drilling and exploratory drifting on all levels below the 500; reorganization of the general ore transportation system; and extension of mechanical ventilation to the lower levels to reduce temperatures in drifts and stopes and to eliminate methane gas occasionally encountered. Hydrogen sulphide gas found in some sections of the mine is effectively neutralized by bubbling through lime water. New ventilation equipment installed since reopening the property includes a Joy Axivane 22,000-cfm fan with lock on the second exit and driven by a 20hp motor. It is erected at the site of the collar of a raise 160 ft above the collar of the main shaft.

Access to the mine is afforded by tunnel and an internal two-compartment shaft or winze extending from

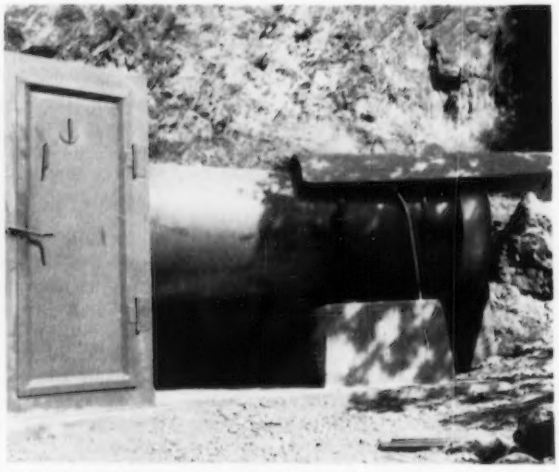
NEW ACTIVITY at the modernized quicksilver property centers around crushing plant (left), and furnace plant (at center).



SKID-MOUNTED compressor is by Atlas Copco, produces 325 cfm. More than 80 tons of 7-lb Hg ore are treated daily at plant.



MINE TRAINS composed of 1-ton cars are moved out of the main haulage level by an Eimco low-pressure air locomotive.



NEW EQUIPMENT includes Joy Axivane fan, installed at collar of raise 100 ft above main shaft, driven by 20hp motor.

this main haulage level down to the 975. Principal development consists of 10 levels, the 60, 150, 220, 360, 500, 620, 690, 775, 875 and 975. All levels below the 500 are active, and some development work is scheduled to be done on the upper levels sometime in the future.

The hoisting compartment of the shaft measures 4½x6 ft, and the manway 3x6 ft. Hoisting is done with double-deck cage and 1-ton cars. Developed ore, in general, is mined by the shrinkage stoping method, though some square-set work is required at times in soft rock. Drift and stope drilling is done with Atlas Copco, I-R, and G-D pushdrills, and blasted material is loaded into the 1-ton cars by Eimco RockerShovels.

Eimco low-pressure air locomotives, purchased recently, are handling train haulage on the main level terminating at the crushing plant, and cars loaded with burned ore at the furnace plant for transfer to the waste dumps. The mine makes a normal amount of water, which is handled by centrifugal pumps. Ground below the 975-ft level scheduled for exploration and development is being dewatered ahead of sinking by special deepwell pumps operating in 5-in. diamond drill holes drilled from the 975-ft level to a depth of 200 ft.

Treatment of mined ore at the furnace plant follows standard practice. Ore is reduced to 1½ in. in two Kue-Ken jaw crushers and burned in a 4x64-ft rotary furnace. Gases laden with quicksilver generated in the furnace pass successively through a dust chamber, Sirocco dust collector, and a pipe condenser unit before entering the flue system leading to the stack.

Surface plant improvements completed recently include new engineering and assay offices, and enlargement of the change and shower room. Two Atlas Copco compressors, 325- and 500-cfm units, have been added to the existing compressor plant to provide additional compressed air to mine and plants.

Operating personnel includes C. N. Schuette, general manager, Bert Larsen, general superintendent, and Doug Meyers, mine foreman.

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WHAT'S NEW IN U. S. PATENTS

OLIVER S. NORTH

Exploration

Apparatus for taking earth cores or samples from the ocean bed. Device is lowered to the bottom, where its weight causes penetration of the bed by a coring tube. Release of tube from bed is automatic, and it is buoyed up with the contained sample. A. Del Raso and C. J. Sonich. No. 2,798,378.

Apparatus for taking samples of sands or fluids in drill holes. Nose of the sample-taking projectile is adapted to penetrate fairly deeply into the formation, beyond the mud cake zone, before drawing in an uncontaminated sample. B. Schneersohn, assigned to Societe de Prospection Electrique Procedes Schlumberger. No. 2,799,474.

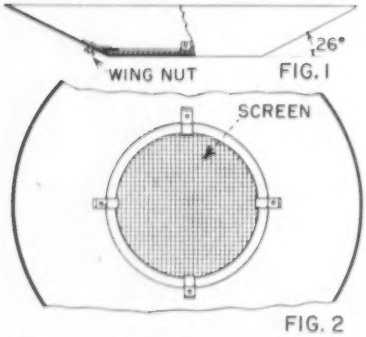
Mining

Design for an automatic-switching cage-hoisting plant and system for a three-compartment mine shaft. J. J. Torrance and F. Ashley, assigned to Coal Industry (Patents) Limited. No. 2,797,834.

Explosive apparatus designed to perform maximum work with minimum damage to surrounding areas and apparatus. Explosive charge, shaped to direct the force over a pre-selected area, is encased in a cellular insulating material, such as pumice or sponge rubber, which absorbs forces that normally would radiate in undesired directions. Mechanism is especially adapted to be used inside a drill hole without damage to the bit. M. A. Ryan, assigned to Phillips Petroleum Co. No. 2,797,892.

Metal and Mineral Processing

Ore Dressing



Construction of gold mining pans used for manual concentration, ore sample testing, and the like. Improvements consist of decreasing the angle that the side wall makes with the bottom, and attaching to the bottom of the pan a circular screen ore trap to catch values. Recovery of fine and flake gold is said to be increased with this pan.

Mr. North is patent consultant, Washington, D. C.

Fig. 1 is a side elevation view, partly in section. Fig. 2 is a plan view showing the ore trap in place.

In accordance with this invention, the side wall makes with the bottom a minimum angle of 18 and a maximum angle of 26 deg, instead of the 40 to 45 deg of prior pans. The low-angle side wall permits maximum separation by gravity during manipulation of the pan. Ore trap is a circular mesh screen with metallic rim secured to the pans by wings of angle clamps affixed to the side wall by bolts and wing nuts. If desired, canvas or other matting may be placed under the screen to retain ore fines. B. A. Kress, one-half assigned to Frank J. Broemeling. No. 2,797,809.

Improved method for floating non-sulphides from ore pulps containing ions that interfere with flotation of the mineral. Small quantity of a water-soluble inorganic sulphide is added to the ore in the pulping mill, and pulp is subjected to flotation, using an anionic collector. Presence of an alkaline sulphide in the pulp makes possible a significant reduction in amount of collector used, and results in improved quality of concentrate and over-all recovery of mineral values. Method is particularly useful when applied to oxide ores of iron, manganese and tungsten. E. C. Tveter and J. C. Lokken, assigned to Dow Chemical Co. No. 2,797,808.

Copies of U. S. Patents can be purchased at 25¢ each from Commissioner of Patents, Washington 25, D. C.

Delaminating and comminuting mica by ultrasonic vibration. Mica is suspended in water in a screen enclosure and subjected to vibrations. As the mica is reduced to screen mesh size it passes through and is recovered. E. C. Kunz and D. Ensminger, assigned to Eric C. Kunz. No. 2,798,673.

Process for fractionation and recovery of rare earth mixtures. Metal values are absorbed onto a non-acidic cation exchange resin, contacted with an amount of an ethylenediamine tetraacetic acid to complex some but not all of the earths. Two portions of the resin are separated, and each fraction is subjected to further treatment using variable amounts of acid to further concentrate successively fewer of the earths. F. H. Spedding, F. J. Wheelwright and J. E. Powell, assigned to U. S. Atomic Energy Commission. No. 2,798,789.

Method for recovering gold or other minerals from colloidal clays. Material is sprayed with an alkaline aqueous solution while being screened into waste, medium and fine fractions. Middling product is treated by gravity methods, while the fines fraction is agitated to further disperse the clay. Use of an alkaline solution, such as a complex phosphate or a mixture of crude tannic acid with either hydrated lime or caustic soda, causes dispersion of the sticky hydrophilic colloidal clay and enables effective recovery of mineral values. R. P. Morrison. No. 2,801,003.

Hydrometallurgy

Low-temperature leaching method for extracting uranium from sulphidic materials, such as ores, concentrates, residues, intermediates, by-products and the like. Mineral sulphides present in the ore are utilized in the process, which, therefore, is most applicable to uranium ores containing pyrite, pyrrhotite, chalcopyrite, etc. If the ore does not contain enough mineral sulphides, a quantity of sulphide-containing material is added to the solution. F. A. Forward, and J. Halpern, assigned to Canadian Patents & Development Ltd. No. 2,797,977.

Pyrometallurgy

Improved method of roasting finely divided phosphate ores on Dwight Lloyd sintering machine. Ore is intimately mixed with carbonaceous fuel and water in a pug mill. At the end of the pugging operation, recycle fines from a prior sintering operation are thoroughly blended with the mixture of ore, fuel and water. Resulting feed is then sintered in the usual manner.

Previously, practice has been to add recycle fines, before pugging, causing excessive abrasive wear on the mixer and producing a sinter feed having a low burning rate. It has been found that adding recycle fines at the end of the pugging operation allows use of a sinter feed having a wider range of water content, increases productive capacity of the sinter machine by permitting use of deeper burning beds, and improves sinter quality.

Optimum output occurs when 20% fines have been added after pugging, and the feed moisture is about 18.5%. J. C. Barnett and J. D. Barnhill, assigned to Monsanto Chemical Co. No. 2,799,573.

Continuous process for electrically smelting siliceous manganese ores to produce ferro- and silico-manganese. A bulky carbonaceous material, such as sawdust or other wood waste, is used to retard the rate of descent of ore and flux into the smelting zone, thereby permitting attainment of sufficiently high temperatures to readily smelt the charge and reduce the manganese. R. T. C. Rasmussen. No. 2,799,574.

Design for a pallet-type machine for high-temperature sintering of taconite pebbles. Means are provided for cooling the pallets during operation by forced circulation of a cooling medium through the track-bridging pallet frame members.

(Continued on p. 110)

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C Bronze yoke bushing
D Iron yoke cap with zerk fitting for lubricating bushing
E Steel yoke cap bolts and nuts
F TYPE 316 STAINLESS STEEL spindle
G NI-RESIST CAST IRON, TYPE 2, yoke
H Bronze eye bolt nuts
I Malleable iron gland flange
J Steel gland eye bolts
K Steel gland lug bolts and nuts
L TYPE 316 STAINLESS STEEL gland
M Teflon impregnated asbestos packing
N TYPE 316 STAINLESS STEEL bonnet bushing
O NI-RESIST CAST IRON, TYPE 2, bonnet
P Steel bonnet bolts and nuts
Q TYPE 316 STAINLESS STEEL spindle ring
R Asbestos gasket
S TYPE 316 STAINLESS STEEL wedge pin
T NI-RESIST CAST IRON, TYPE 2, through-port body
U TYPE 316 STAINLESS STEEL solid I-beam wedge
V TYPE 316 STAINLESS STEEL seat rings

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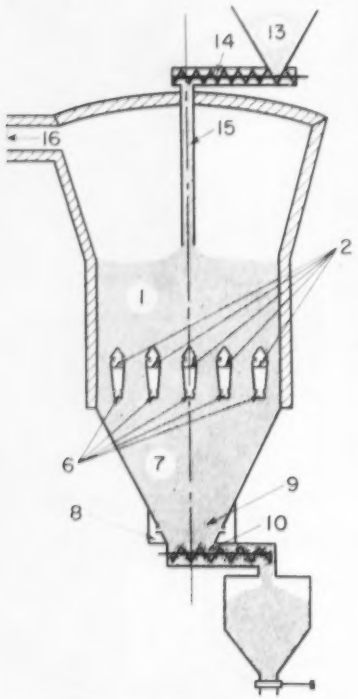
WHAT'S NEW IN U. S. PATENTS *(Continued)*

Thus, pallets are prevented from softening and sagging with continued use in a highly heated environment. W. M. Duncan. No. 2,800,319.



Apparatus and method for fluidized roasting of sulphide ores, especially sphalerite. Instead of being admitted to the furnace at a single level below the entire bed, oxidizing gas is injected at different levels and with different velocities to produce three zones in the bed: fluid, turbulent, and quiet. This method permits more uniform desulphurization of both large and small particles, and consequently requires less precise sizing of the feed material, which may be either natural or granulated ore.

Drawing is a diagrammatic elevation view of this apparatus. Furnace comprises chamber (1) fed from bin (13) by screw (14) to feed pipe (15) with orifice (16) for escape of roasting gases. Hollow stainless steel bars (2) passing through the furnace are provided with nozzles (4) for admission of primary air under high pressure and nozzles (6) for admission of secondary air under intermediate pressure.

Tertiary air under low pressure from wind boxes (8) is admitted through pipes or nozzles (9). Ore is fed to the chamber at a rate necessary to maintain predetermined level. Portion of the bed above nozzles (2) is the fluid section.

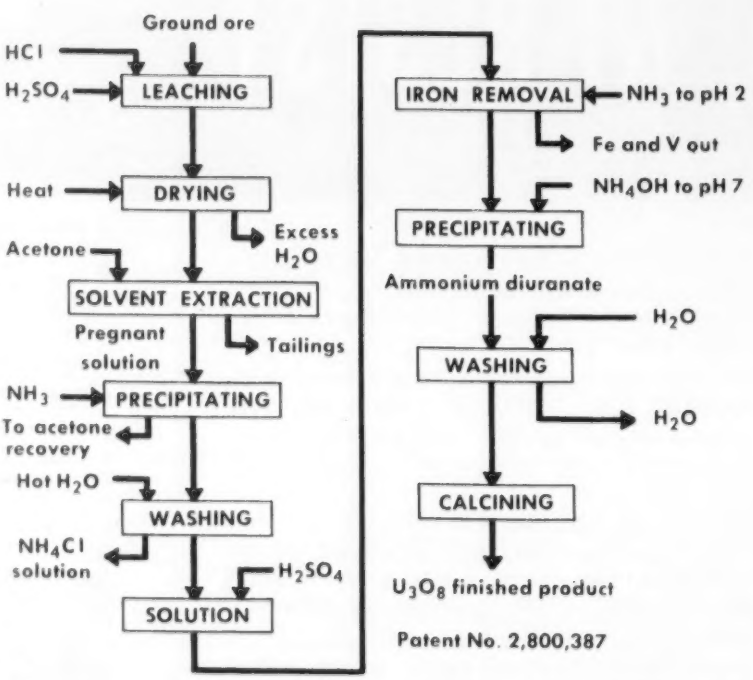
As material moves downward into insulated bin (7), it gradually passes from a fluid to a turbulent to a quiescent state, and desulphurization is continued with air from nozzles (6) and, still lower, from nozzles (9). When the material has progressed by gravity to removal screw (10), it is substantially free of sulphur in sulphide form. A. A. J. Quintin, assigned to Compagnie des Metaux d'Overpelt-Lommel et de Corphalie. No. 2,797,987.

Process for reducing iron ore in a vertical furnace, using hydrogen and carbon dioxide gas. Gas exhausted at the top of the furnace is purified of aqueous vapor and carbonic acid and re-admitted to the bottom of the furnace with additional heated fresh gas. About half of the cooled sponge iron recovered from the bottom of the furnace is fed back at the top of the shaft, together with unreduced iron ore. Thus, the temperature is maintained within relatively narrow limits and the ore is satisfactorily reduced without fusing. O. Jensen, assigned to Norsk Hydro-Elektrisk Kvaelstofaktieselskab. No. 2,797,989.

Method for preventing clinkering of iron ore pellets during firing. Iron ore fines are moistened, rolled to form pellets, and then the pellets are rolled together with a finely divided refractory material, such as commercially available mullite. Refractory forms a hard shell on the pellets and prevents clinkering during the burning and curing phases. In their fired form, such pellets have high crushing strength, but are porous and therefore can be readily reduced in the blast furnace. G. J. Holt and L. J. Erck, assigned to Cleveland-Cliffs Iron Co. No. 2,799,572.

Preparation of iron-nickel-cobalt ores for recovery of metal. A dilute slurry of ground ore is heated to a temperature of 140 to 210 deg F., concentrated by settling and decantation, and the enriched slurry heated to the required reaction temperature. Overflow from the decanting operation is used to pulp another batch of ore to form the dilute slurry in the next cycle, resulting in considerable savings in heat consumption. C. S. Simons III, assigned to Freeport Sulphur Co. No. 2,798,804.

RECOVERING URANIUM WITH ACETONE



Patent No. 2,800,387

Recovery of uranium values from carnotite, pitchblende, uranium shales by solvent extraction following acid treatment. Ore is disintegrated, contacted with sulphuric acid and free HCl acid, and the slurry contacted with acetone. Uranium values are taken up by an extract phase, a residue settles, and the extract phase is then separated from the residue.

Flowsheet shows the practice of this invention as applied to a carnotite ore of average lime content. R. B. Kimball and R. A. Ewing, assigned to U. S. Atomic Energy Commission, No. 2,800,387.

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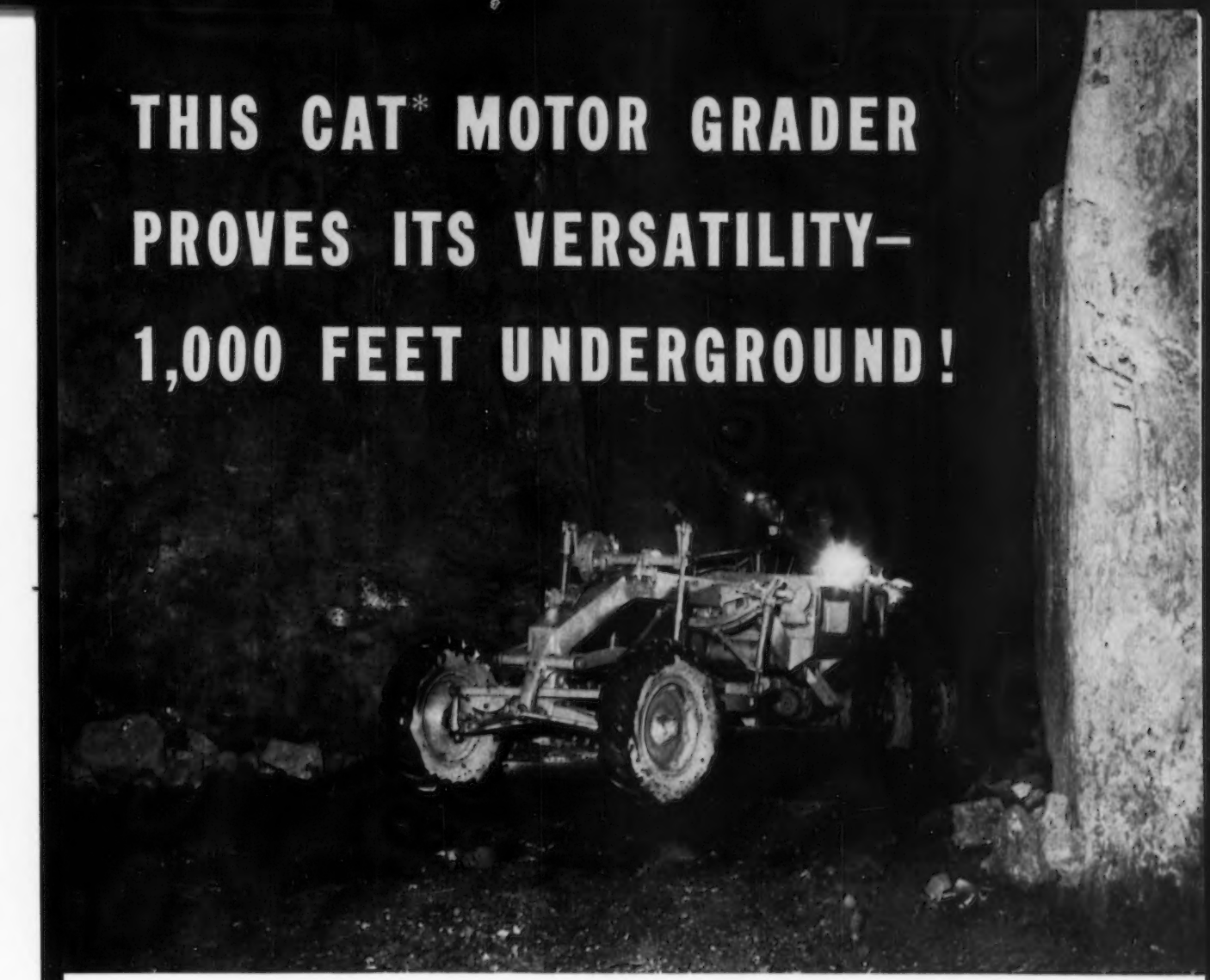

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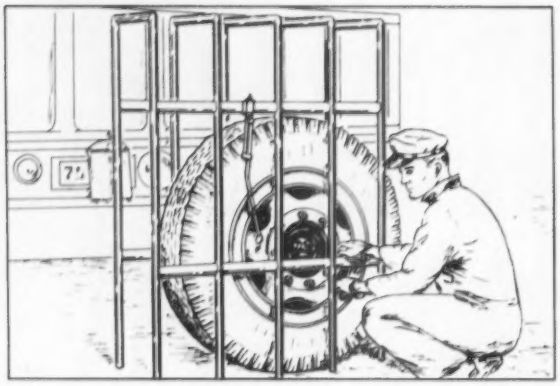


Safety Guard for Truck Tires

AMONG safety features devised and applied at maintenance shops of Morrison-Knudson Co. is the simple tire guard shown. Company services equipment engaged in mining and transporting fill for the tailings pond dikes of Kennecott Copper Corp., Utah Copper Division, near Magna, Utah. Guard affords protection to operator against blowout hazard when inflating truck tires. Cage-like structure can be made at low cost from used light pipe and strips of flat iron, welded throughout. Morrison-Knudson operates 12 Mack B-63 trucks between quarry at Garfield and dike sections to be built up by fill.

Australians Develop New Rutile Extraction Process

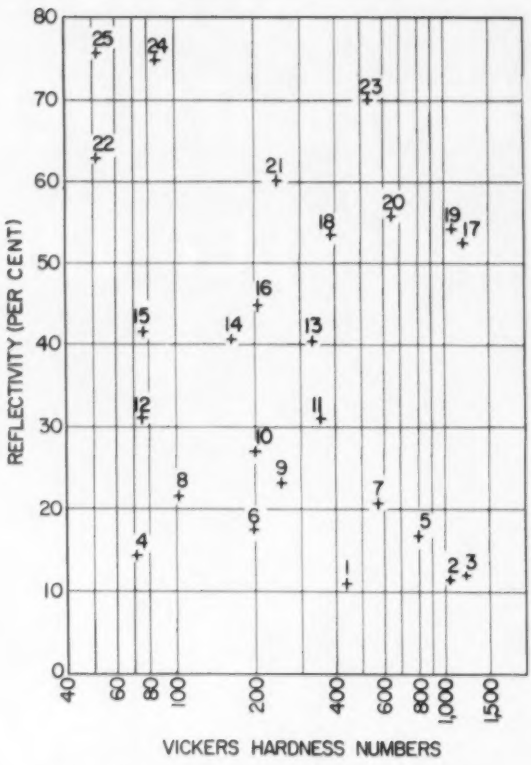
NEW METHOD of rutile extraction from ilmenite has been announced by scientists of the Division of Industrial Chemistry, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia. More efficient and economical extraction of the rutile form of titanium will be the result of this process, Australian experts predict.

First stage of the new operation calls for the mixing of ilmenite grains (beach sand deposits) with 20% pyrite and 10% coke, charcoal or coal. Mixture is then placed into an air-excluded kiln and heated at a temperature ranging between 650 and 900 deg C for half an hour or more until reaction is completed.

After cooling in absence of air, the material (intergrowth of iron sulphide and micro-crystalline rutile) is subjected to air and water at 200 lb per square in. and 120 deg C and is broken down. What remains after this treatment are porous grains of rutile, globules of free sulphur and fine hydrated iron oxide. At this stage of the process, and while still in the pressure-treatment water, components may easily be separated from mixture. Sulphur is removed and now takes the place of pyrite in original feed mixture. From remaining iron oxide sludge, rutile is taken out and rewashed with sulphuric acid (consumption of which should not be greater than 10% of rutile weight).

Although the granular rutile may now contain less than 0.5% iron oxides, contaminant minerals such as zircon, garnet, quartz and chromite will be present. Conventional ore dressing methods of separation must be employed if these contaminants are present at any great extent.

Amount of rutile recovered from normal Australian ilmenites up to now is about 90% of total titanium oxide content of the ilmenites. Generally speaking, two tons of ilmenite will provide about one ton of rutile product. Rutile with less than 1% iron can be produced and chromium can be reduced to negligible values. At present, however, no claim is made that pigment-grade rutile can be directly produced by the above process.



Reflectivity-hardness values for a few common ore minerals

1 Betafite	7 Magnetite	13 Pyrrhotite	19 Pyrite
2 Cassiterite	8 Bornite	14 Boulangerite	20 Skutterudite
3 Chromite	9 Alabandite	15 Galena	21 Krennerite
4 Covellite	10 Cuprite	16 Chalcopyrite	22 Altaite
5 Uraninite	11 Tetrahedrite	17 Cobaltite	23 Platinum
6 Blende	12 Stibnite	18 Niccolite	24 Antimony
		25 Gold	

Two Minute Ore Mineral Test

SYSTEM FOR RAPID MINERAL IDENTIFICATION in polished sections, combining characteristics of reflection and hardness, has been developed by the Geological Survey of Great Britain, Atomic Energy Division.

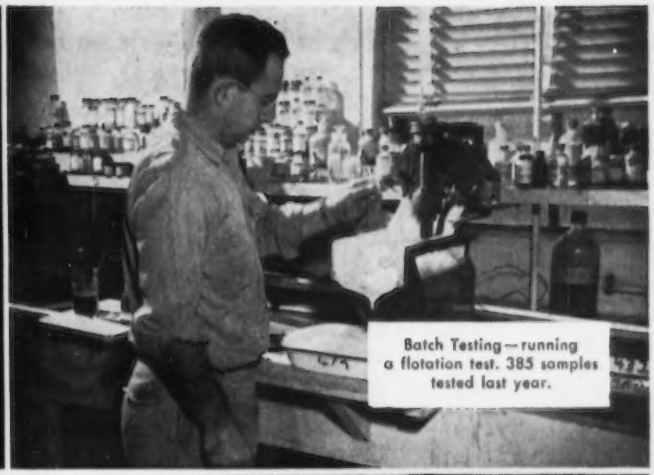
An electric cell photometer and micro-hardness tester are fitted to a standard ore microscope. The specimen's reflectivity is measured by comparing it to tungsten filament illumination of specified color temperature. The diamond pyramid hardness tester is then swung into position and brought down on the mounted ore to create an indentation. When viewed through the objective, this indentation is measured and expressed in terms of Vickers hardness numbers. Initial reflectivity readings can be made on grains of about 30 microns in diameter and within a precision of 1%.

Reflectivity hardness results for twenty five common ore minerals are shown in the chart. Their distribution shows clearly that minerals of similar reflectivity can be differentiated by means of the indentation hardness test. Individual mineral ranges caused by reflection anisotropy and directional variations in hardness have been omitted for clarity.

The reflection-hardness test is rapidly performed (less than one minute per measurement) and when used in connection with other easily observed properties such as color, anisotrop ism and reflection pleochroism, most ore minerals can be identified without resorting to spectrographic or X-ray methods. For the initial experiments, the hardness tester used was a G.K.N. bench-type instrument, manufactured by Hall Telephone Accessories, Ltd.

E&MJ thanks the Geological Survey of Great Britain and the publication *Nature* for permission to reprint their texts.

DENVER ORE TESTING



Batch Testing—running a flotation test. 385 samples tested last year.

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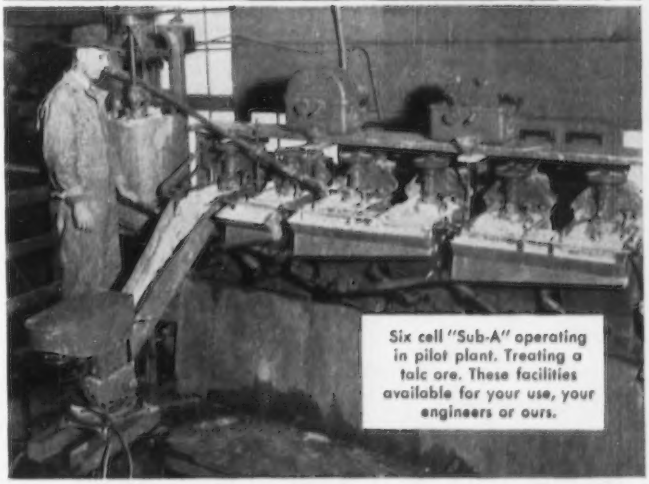
Clarence Thom heads the DECO Ore Testing Division and is but one of our many practical, experienced engineers who are ready and able to help you with your problems...TODAY!

Batch-Cyanidation testing—and determination of settling thickening rates.



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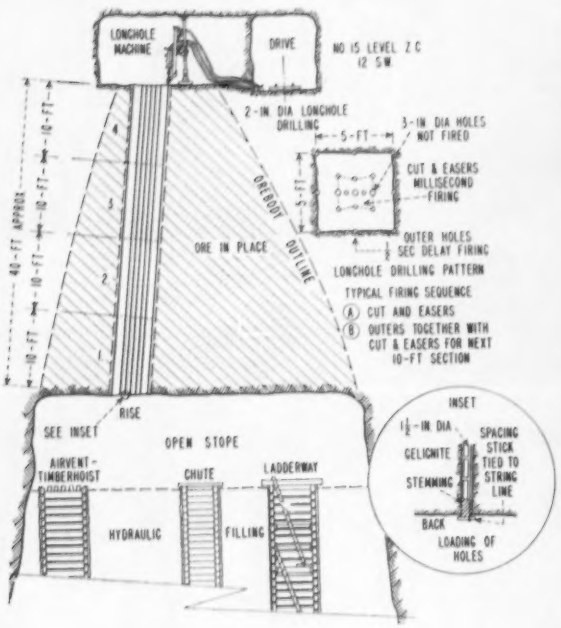
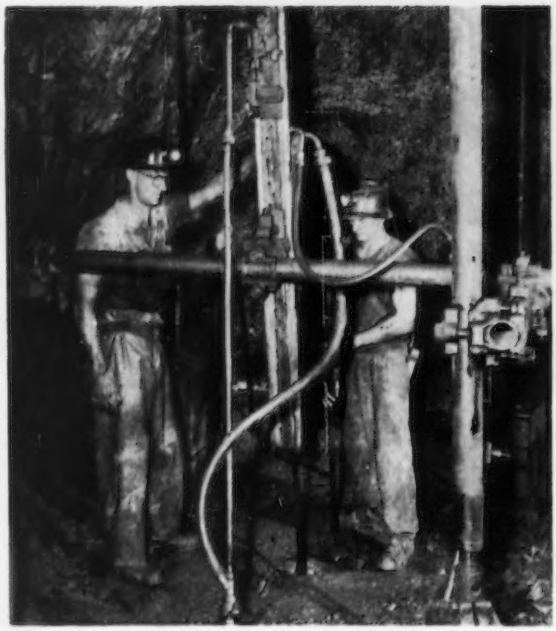
Mining Firm Cuts Drilling Cost up to 24%



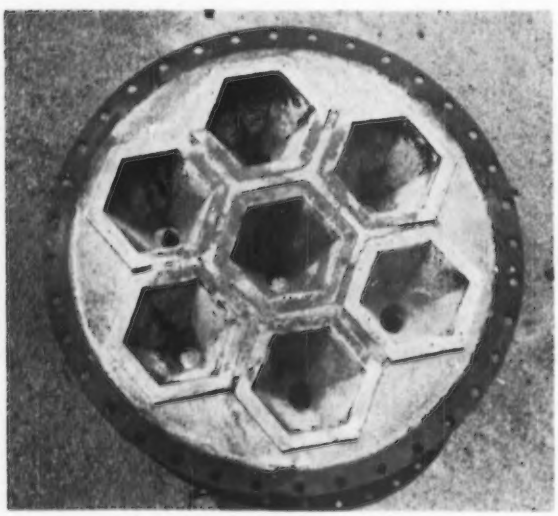


Australians Develop Long Hole Drilling Technique

IMPROVED LONG HOLE DRILLING TECHNIQUE, developed by Australian engineers and used at the Zinc Corp. Ltd.'s mine, Broken Hill, Australia, has proved less costly than conventional winze operation.

From a cut at the side of a drift at Broken Hill, 19 parallel holes were drilled downward to the stope 40 ft below. Large 4-in. mounted drifter produced the five-hole slot, three holes of which were drilled 3-in. in diameter to insure good initial firing. These holes were not fired and provided breaking faces for the other two cut holes.

Charging was done from the cut on top and the raise was blasted on 10-ft sections starting from the bottom. Large 1½-in. plugs of gelignite were exploded, producing smooth walls for an ideal airway. Barring down was done only once after all the 10-ft sections of the rise had been fired, resulting in greater safety and increased production.



Sulphide Ore Copper Extraction

EXTRACTION OF COPPER FROM SULPHIDE ORES had proved quite practical in large-scale operations but fell short when small or medium-sized operations were needed. Once again, however, the Division of Industrial Chemistry, Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, seems to have come up with another practical ore-extraction process.

Past experiments were conducted along lines of "roasting" sulphide minerals at high temperature to obtain copper compounds which could then be dissolved in dilute acid. Combination of copper with oxygen from the air would produce the compound and sulphur would be given off in the form of sulphur dioxide. These experiments failed—they could not be properly controlled with available equipment. Fluidization caused a revival of interest in the process and Australians hoped to apply the fluidized-solids method to local materials.

When pilot plant unit with a 3-ft 6-in. diameter was set into operation, the old problem arose of particles sticking together to form a solid mass at the base of the roaster. Australian experts solved this problem by completely redesigning the air intakes at the roaster base.

Deep, tapering holes set in a base of refractory concrete replaced many-holed base used during earlier experiments. The tapering holes, though fewer in number, were large enough to produce a honeycomb pattern covering most of the cross section area of the roaster. Base stagnation zones were greatly reduced and enough air was injected to force solid deposits to the top of roaster.

New air intake system succeeded in maintaining material in the finely divided form most suitable for control of roasting process, and was also the most satisfactory way sulphide copper ores could be treated to give products from which copper would be readily obtained by the electrolytic process.

Mining Firm Cuts Drilling Cost up to 34% With a Bucyrus-Erie 50-R

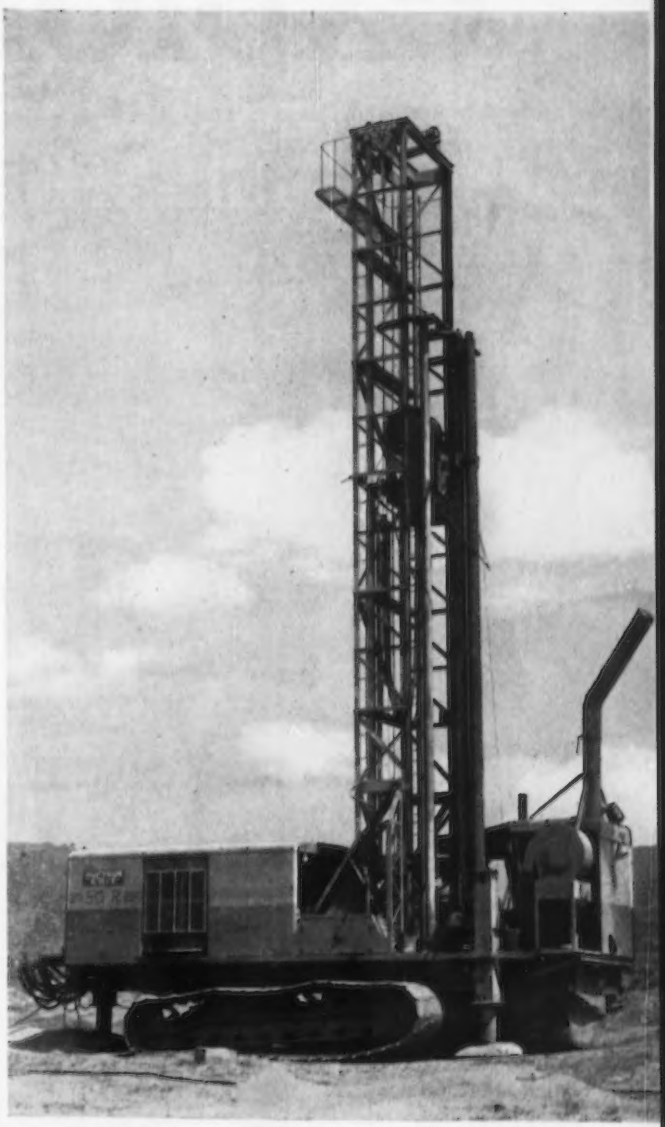
Rate of Penetration in Taconite Formations Is Four Times the Rate of Cable Tool Drills

In 1953, a mining company began extensive tests on the Mesabi Range to determine the feasibility of rotary blast hole drilling in taconite.

At the end of this initial test work, the following conclusions were reached: 1.) Rotary drilling was feasible on the Mesabi Range. 2.) Larger rotary bit sizes held promise for better bit life. 3.) It would be necessary to change over from a smaller rotary drill to a Bucyrus-Erie 50-R to accommodate bits up to 12¼-in. diameter.

By the end of 1956, some 112,250 feet had been drilled, half of it through hard or medium-hard taconite. Reductions in costs ranged up to 34% compared with cable tool rigs.

Among the features that contribute to the 50-R's fine performance on the Range are the following: Using compressed air to cool the bit and clean out cuttings, the need for water is removed — especially important during cold weather. Heavies pile up adjacent to the hole, providing handy, excellent stemming material and permitting dry sampling. A remote-controlled, power-driven drill pipe rack minimizes manual effort. Hydraulically powered down pressure on the bit provides controlled load on drilling tools for maximum penetration. And Ward Leonard electric control on rotation of the drill pipe permits drilling at the most efficient speed for a given formation.



Two Bucyrus-Erie rotaries are available — the 40-R for drilling 6¾- to 9-in. holes, the 50-R for drilling 9⅞- to 12¼-in. holes. Get all the facts on these drills today.

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BUCYRUS ERIE

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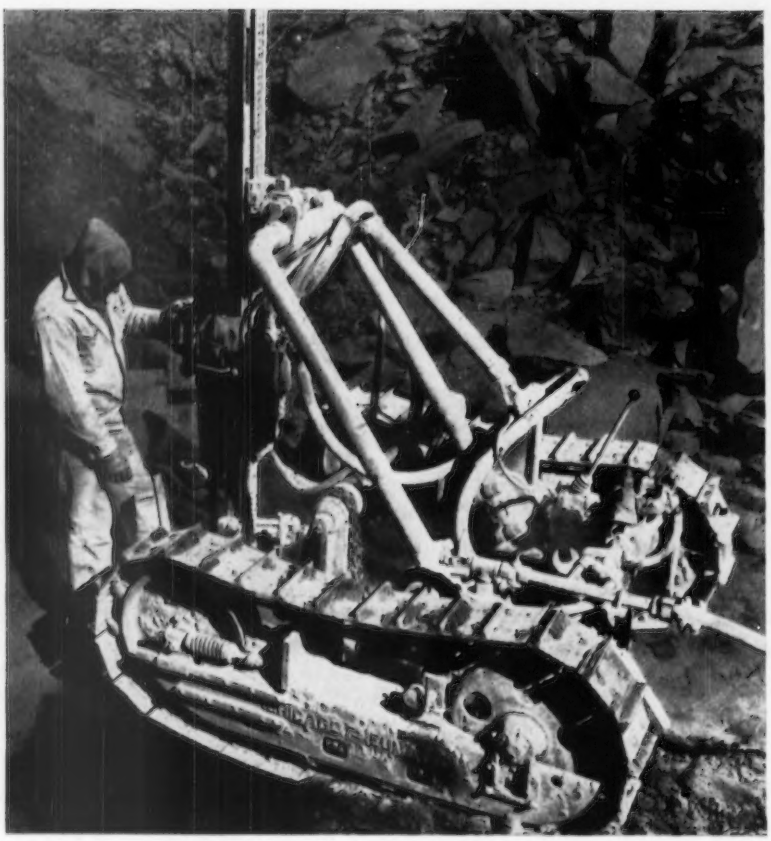
exploratory

CP Core Drills are designed to provide the greatest degree of versatility. Mounted on skids, they can be readily moved from one hole to another under their own power. Bolted framing permits fast knock-downs for transportation to remote sites. Available without skids for truck or jeep mounting. Air, electric, gasoline and diesel drives. Capacities: Model 8HD—1250 ft. with E-EX fittings; Model 15HD—2250 ft. with E-EX fittings.

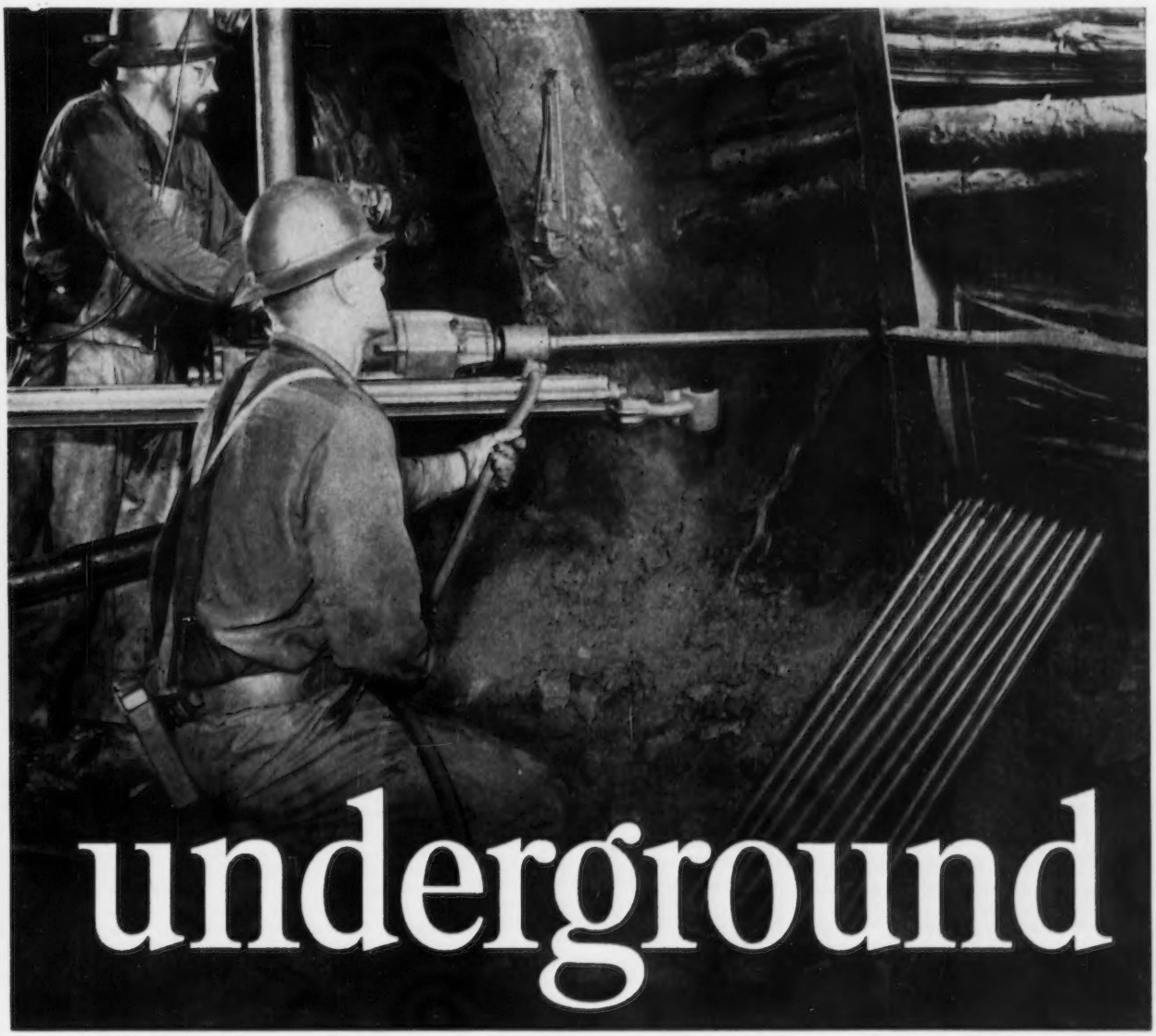
open pit

The G-800 Tracdril is a one man drilling crew that's ideal for removing overburden. Combines the drilling speed of a CP-400 heavy Drifter with the adaptability of a self-propelled track mounting. The Tracdril tows its own air supply, takes toughest terrain in stride. Uneven ground is no problem . . . the Tracdril's "knee action" tracks keep the hydraulically operated U-arm level.



The CP-555 Rotauger is perfect for drilling long blast holes in close quarters. Short in length, long on performance. The Rotauger can more than double your footage in the softer formations. Available for wet or dry drilling, drills 2½″ holes at speeds up to 8 feet per minute and to depths of 100 feet.

These products are only a sample of the complete CP line of equipment for metal mining. Hydraulic Boom Arms, Stopers, Drifters, Airlegs, Pneumatic and Electric Tools, and Portable and Stationary Air Compressors are also available.



THERE'S A CP DRILL TO "FILL THE BILL" IN METAL MINING

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PERSONALS

Dr. Frederick C. Kruger has been promoted to director of mining and exploration for International Minerals & Chemical Corp., Chicago. He joined the company in February of this year as chief geologist and since June has been acting head of the mining and exploration department. Formerly assistant chief geologist for Reynolds Metals Co. at Little Rock, Ark., he held the same position with Cerro de Pasco corp., at La Oroya, Peru, from 1941 to 1949.

Elliott S. Wyman, of Sacramento, has been elected president of the Summit Lime Co. of Tehachapi. Other new officers elected recently include **Vernon Bettin,** vice president; **Francis Wyman Morris,** secretary-treasurer; and **Julia M. Wyman** and **Miriam Perelli Minetti,** directors. The company was founded in 1886.

R. D. Bradford, vice president and director of American Smelting & Refining Co., has been placed in charge of the company's Federated Metals Division. Mr. Bradford will retain the presidency of Lake Asbestos of Quebec Ltd. A native of Salt Lake City, with an M.S. degree in Mining and Metallurgical Engineering from the University of Utah, he joined Asarco in 1926 as a junior metallurgist at the Garfield smelter. In 1951 he was appointed general manager of the Western Department, followed by election to a vice presidency in 1952. In April of this year he was elected a director, and he also serves as a director of several subsidiaries and affiliates.

Bradford

Sir Chester Beatty retired from the board of directors of American Metal Co., Ltd., after serving on the board since 1930, and until 1950 as chairman of Selection Trust Ltd. and of Rhodesian Selection Trust Ltd., Mufulira Copper Mines Ltd. and Roan Antelope Copper Mines Ltd. Elected to the board to fill the vacancy is **Eric J. T. Goudie,** who is also a director of Selection Trust Ltd. and other companies. **Frank B. Common,** Q. C., senior partner of a well-known Montreal firm, was also elected to the board.

E. Cecil Roper has been elected president and chief executive officer of Howe Sound Co. A mining engineer with the company for 20 years, Mr. Roper has been serving as executive vice president since January 1956, and as a director since February 1957. As president, he succeeds **Harold H. Sharp,** who is retiring after 28 years with the company.

George C. Heikes, former chief mining engineer for National Lead Co., has been named manager of mineral resources for Continental Uranium, Inc., with offices at Grand Junction, Colo.

Appointed general manager of Trent Tube Co.'s new plant at Fullerton, Calif., **Richard K. Dickson** was previously chief metallurgist at the home plant (Wis.) of this wholly-owned subsidiary of Crucible Steel Co. of America.

Richard B. Davern was appointed treasurer of Oliver Iron Mining Division, on July 1, succeeding **Raymond L. Larson** who retired after 45 years with Oliver.

W. A. Bowes, former head of the AEC field office in Bakersfield, now heads the AEC field office in Reno. Transfer to Reno took place at end of July. **Richard Miller** heads the Bakersfield office now.

Slated to receive American Society for Metals' Gold Medal and senior award is **Dr. John Chipman,** head, metallurgical department, Massachusetts Institute of Technology, for his "gifted teaching and inspired research" which has "helped lift metallurgy to a highly respected plane of science and engineering." Dr. Chipman, regarded as "the father of metallurgical thermo-dynamics", has made contributions in the field of slag control, oxidation and deoxidation and high temperature chemistry. **Dr. Tokushicki Mishima,** professor emeritus, University of Tokyo, Tokyo, Japan is to receive the Albert Sauveur Achievement Award for his "perfection of strong permanent magnets". He is considered to be Japan's most eminent living metallurgist; in 1950 he received the Cultural Medal and Decoration from the Japanese government, its highest civil recognition. The Gold Medal for the Advancement of Research will go to **Roy C. McKenna,** board chairman of Vanadium Alloys Steel Co., Latrobe, Pa. An Honorary Life Membership will go to **William Hume-Rothery,** lecturer in Metallurgical chemistry at Oxford and the University of Sheffield, England, for ". . . contribution to our knowledge of the nature of the atom, and particularly its behavior in metals and alloys." Other awards will also be made at the Society's 39th National Metals Exposition and Congress in Chicago, Nov. 2-8, 1957.

Erie Mining Co., subsidiary of Pickands, Mather & Co., announced several staff changes and promotions. Some are: **Olaf T. Berge,** to chief district mining engineer; **Robert W. Bell,** superintendent of No. 2 and 3 pits; **Robert C. Baxter,** promoted to mine superintendent at No. 1 pit. **R. F. Kohn,** assigned to position of superintendent of operations at the Erie preliminary taconite plant; **Earl Johnson,** promoted to ore dressing superintendent; **Kenneth R. Groll,** appointed agglomerating superintendent.

W. A. Knoll retired July 1 as general superintendent for Pickands, Mather & Co. on the Gogebic range. Other changes and promotions include: **Carlton D. Bailey,** assistant general superintendent since 1946, became general superintendent. **Frank Werther,** who joined PM&Co in 1954 at Duluth in the operating department, was promoted, replacing Mr. Bailey. **John Wangaard,** superintendent of the Cary mine at Hurley, Wis., was appointed superintendent of the Peterson mine at Bessemer. **Russell Jose,** superintendent of the Gemeva mine, between Ironwood and Bessemer, has had the Newport mine, Ironwood, of the Mauthe Mining Co. added to his supervision.

S. Norman Kesten has been promoted to assistant chief geologist of American Smelting & Refining Co.'s northwest mining department and put in charge of all mining and exploration geology in northwestern U. S., under the direction of chief geologist **P. I. Conley.** Mr. Kesten is a graduate of the University of Toronto and was chief geologist for El Dorado Mining & Refining Co., Canadian government firm, before joining Asarco at the McMillan project in the Yukon in 1951.

Formerly consulting metallurgist at International Nickel Co. of Canada, Ltd., at Copper Cliff, Ont., **Kelvin Sproule** has been transferred to the development and research division at the New York office, where he is associated with Inco's investigations concerned with use of atomic energy effects in research. He has been with the company since 1937 and is a member of the Canadian Institute of Mining and Metallurgy, Engineering Institute of Canada, American Society for Metals, the AIME, and Society of Sigma Xi.

Sproule

Formerly director of laboratories for Apex Smelting Co., **Donald L. Colwell** has been elected vice president in charge of laboratories and research for that company.

Dr. Robert W. Lindsay, formerly Professor of Metallurgy at Pennsylvania State University, has joined the staff of Crucible Steel Co.'s Central Research Laboratory in Pittsburgh, effective Sept. 1. He will assume the position of Supervisor of Constructional Alloy Steels. Company also announced the appointment of **Dr. John H. Hoke** as supervisor of the stainless steels section. Dr. Hoke joined Crucible from Babcock & Wilcox Co., where he had served three years as a research metallurgist at the company's research center in Alliance, O.

C. DeWitt Smith's election by the board of directors as vice president in charge of operations for the Copper Range Co., with headquarters in Boston, was announced by J. P. Lally, the company's president. Mr. Smith was formerly with St. Joseph Lead Co.

Elected a director of the Rio Tinto Co., Ltd., London, Eng. and of Rio Tinto Management Services (U.K.) Ltd., **Roy W. Wright** has relinquished his Canadian

On this stripping operation

CAT* DW21-NO. 470 RIGS ARE DELIVERING LOW-COST PRODUCTION

You see plenty of rugged Caterpillar-built machines at work on the Marquette Cement Company's stripping operation at Oglesby, Ill. In fact, you don't see any other make. That's the result of years of profitable experience, Superintendent W. T. Spurr will tell you.

The picture above shows one of the firm's seven big DW21s with No. 470 LOWBOWL Scrapers being push-loaded by a D9 Tractor. And it shows something else, too—how to move material at the lowest cost per yard.

These DW21-No. 470 rigs have capacities for big-volume hauling—18 cu. yd. struck, 25 cu. yd. heaped. But more important than capacity, the No. 470's LOWBOWL design has greater loading efficiency than *any other make* of scraper in its class. Actual tests show that the No. 470 gets its rated capacity load and is on its way while other scrapers are still in the cut struggling for the last few yards.

And when it has its big load, the DW21 moves it at high speeds, efficiently. Its 300 HP (maximum output) Cat-built Engine has a Turbocharger to add horsepower at reduced fuel costs. Air is packed into the engine *according to engine load*, not speed. Wide-section, tubeless, 29.5-29 tires provide excellent flotation and furnish greater tractive effort.

Let your Caterpillar Dealer show you how these rugged rigs can move material faster and cut costs on your operation. You can depend on him for sound advice now—for fast service and parts you can trust after you buy.

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WANTED—
THE HARD WORK

PERSONALS (*Continued*)

appointments as managing director to Rio Tinto, Canada, and a directorship of certain other associated companies, to take up full time duties in England.

Formation of the "Australian Association of Mineral Sands Producers" to deal with matters and problems affecting the industry as a whole, was decided upon at a meeting of Mineral Sands Producers from New South Wales and Queensland, held recently in Brisbane. **D. G. Cummins,** of Associated Minerals Consolidated Ltd. was elected president; **J. F. Miller,** of Zircon Rutile Ltd., and **A. T. George,** Heavy Minerals Pty. Ltd., were elected vice presidents. Association's address is 2nd Floor, T. & C. Building, Queen St., Brisbane, Queensland.

Donald A. Ricketts and **Philip J. Hickey** have been named to the posts, respectively, of general superintendent and assistant general superintendent of smelting and refining of the Sierra Division of Cerro de Pasco Corp., in the central Peruvian Andes.

On Sept. 1, the following personnel changes in Phelps Dodge Corp's., Western operations were effected: **Warren E. Fenzi** was named assistant to general manager with offices in Douglas, Arix.; **John A. Lentz, Jr.** was transferred to Morenci as general superintendent of the Morenci branch, replacing Mr. Fenzi; **James A. Briggs** was appointed general superintendent of the New Cornelia branch, at Ajo, Ariz., taking over Mr. Lentz's former duties; **Troy B. Hinton** will become mine superintendent.

R. G. Howard-Goldsmith, formerly with Northern Peru Mining & Smelting Co. in Peru, is now associated with the South American Gold & Platinum Co. in their Bogota, Colombia office.

Officers elected for terms to begin Nov. 11, during the Society of Exploration Geophysicists' 27th annual meeting in Dallas, are: **O. C. Clifford, Jr.,** chief geophysicist of Atlantic Refining Co., Dallas, Tex., as president succeeding **Roy F. Bennett,** Oklahoma City; **Ben F. Rummerfield,** executive vice president of Century Geophysical Corp., Tulsa, Okla., as vice president; other officers will be **Howard E. Itten,** president of Empire Geophysical, Inc., Fort Worth, secretary-treasurer, and **Dr. L. Y. Faust,** of Amerada Petroleum Corp., Tulsa, editor.

Harry L. Schell, mining engineer, has joined the staff of the U. S. Bureau of Mines at Duluth, Minn.

Recent promotions at Oliver Iron Mining Divisions's eastern district include: **Thomas C. Oliver,** to assistant superintendent of the Gilbert open pit mine; **James D. Warner,** to assistant superintendent of the Pioneer underground mine at Ely; **Wayne Tuomi,** to district operating engineer with headquarters at Virginia. **Byron G. Rowell,** Virginia, has been named supervisor of training, replacing Mr. Oliver.

Bruce Williams Laboratories announce the affiliation of **Philip L. Jones** as consultant to their mining and metallurgical department. He is a member of AIME, and is an Associate of the Royal School of Mines, England. Mr. Jones will continue also his independent work in his Joplin office.

Fred D. Waltman has resigned his position as general manager of Florida Manganese, Inc. at Deming, N. M., to accept a position with United Western Minerals Co. of Santa Fe, N. M., where he will be in charge of mining.

Patrick V. Gallagher recently was appointed vice president of McDowell Co., Inc. for its Dwight-Lloyd Div., Cleveland, the research and metallurgical arm of the McDowell group of companies. His professional associations include membership in AIME.

Former director of the U. S. Bureau of Mines, **Scott Turner** has been chosen to receive the Hoover Medal for 1957. The Gold Medal award, sponsored by the American Society of Civil Engineers, the American Institute of Mining, Metallurgical, and Petroleum Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers, will be presented in N. Y. at AIME's annual meeting next February. Both as mining engineer and as head or member of major Government missions, Mr. Turner's career has taken him to many countries, and his achievements in both fields, and in education, have been hailed on many occasions. Some of his enterprises involved extremely hazardous situations and exacting diplomatic skill. Author of some 50 technical papers, he has also received many formal honors from professional societies and universities. He is one of the original group of five men delegated to prepare the canons of ethics in engineering which were approved and adopted by 75 of the engineering societies and groups in North America.

Turner

A Capper Pass Award in respect of a paper on "Outline of a Solvent Extraction Process for the Purification of Niobium from Ores or from Ferro-Niobium," and published in *Transactions* of the Institution of Mining and Metallurgy, for the year 1956, was made to **Dr. J. M. Fletcher, Dr. D. F. C. Morris,** and **Mr. A. G. Wain.**

Dr. Howard L. Hartman has been named professor and head of the department of mining at the Colorado School of Mines, replacing **Arnold W. Asman,** who resigned recently to become product manager of mining equipment sales of Hewitt-Robins Inc.'s Robins Conveyor division at Stamford, Conn. Author of several papers on ventilation, dust control and rock penetration, he wrote his doctoral thesis at the University of Minnesota on "Exhaust dust control in dry percussion drilling." Before joining CSM in 1954 Dr. Hartman taught mining engineering for one year at the Pennsylvania State University where he took his B. S. and M. S. degrees, and for four years at University of Minnesota; he also worked as mining engineer with Phelps Dodge Corp. in Bisbee, Ariz., and as state mine dust control engineer in the Mine Inspector's office at Phoenix.

A three-man executive committee, headed by **Dr. Walter H. Dumke,** associate professor of chemistry, will replace the usual department head system in the chemistry department of Colorado School of Mines during 1957-1958. **Dr. John W. Vanderwilt,** president, said it was a unique experiment in administrative policy. Other members are **Prof. Robert A. Baxter,** a chemistry teacher since 1922, and **Dr. John T. Williams,** assistant professor of chemistry. Dr. Vanderwilt said the committee will have over-all responsibility for the department including all policies, decisions and direction of staff meetings and discussions. **Dr. W. W. Howe,** former department head, retired early this summer.

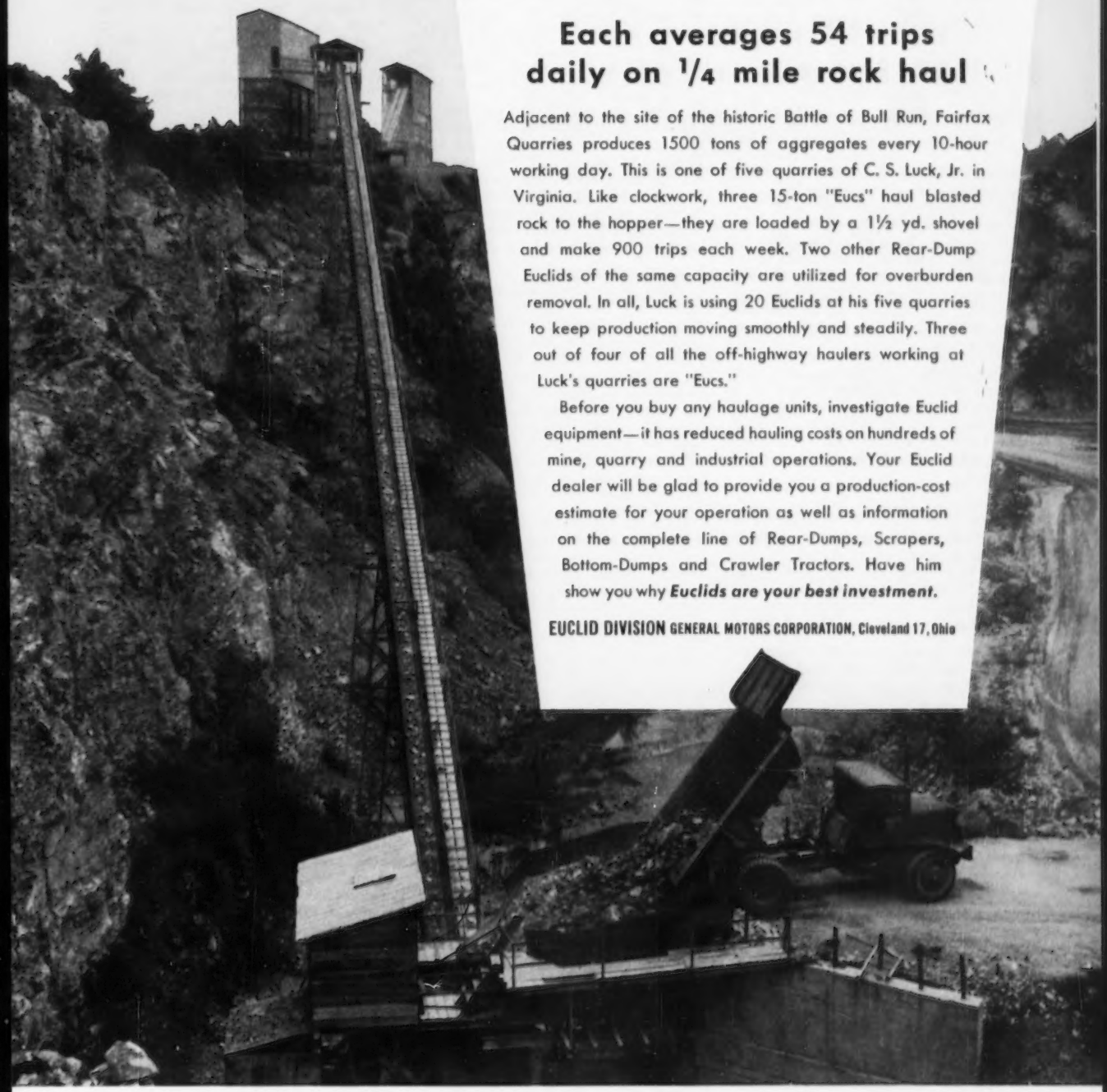
W. G. Reynolds, vice president and director of Reynolds Metals Co., recently was named president of Reynolds International, Inc., in a move to strengthen its overseas operations. Former head of the company's parts division, he will take over leadership of all Reynolds manufacturing and sales activities outside the U. S.

Robert L. Cranmer has been named general manager of Royal Corp. mining firm with uranium properties in San Juan County, Utah and in Wyoming. Mr. Cranmer is secretary of New Park Mining Co., Salt Lake City.

Election of **Nels W. Stalheim** as treasurer of Rio de Oro Uranium Mines, Inc. was announced by **W. Rodney De Villiers,** president of the company. Mr. Stalheim and **Edward R. Farley,** vice president of the Atlas Corp., were elected to Rio de Oro's board of directors as representatives of Hidden Splendor Mining Co., a wholly-owned Atlas subsidiary. The new directors fill vacancies caused by the resignations of **F. A. Fuller** and **A. B. Willis;** the latter also resigned as a Rio de Oro vice president.

W. Lunsford Long, president of Haile Mines, Inc., announced recently that he had become chairman of the board of directors of the company and its subsidiaries, Tungsten Mining Corp. and Manganese, Inc., and that **William M. Weaver, Jr.,** had become president. The action was taken on the recommendation of Mr. Long at directors' meetings Sept. 5. Mr. Weaver has been president for the past nine years, of Frank Samuel & Co., Inc. of Philadelphia, ore importers.

3 "Eucs" haul 150 to 175 loads per day at Fairfax Quarries



Each averages 54 trips daily on 1/4 mile rock haul

Adjacent to the site of the historic Battle of Bull Run, Fairfax Quarries produces 1500 tons of aggregates every 10-hour working day. This is one of five quarries of C. S. Luck, Jr. in Virginia. Like clockwork, three 15-ton "Eucs" haul blasted rock to the hopper—they are loaded by a 1½ yd. shovel and make 900 trips each week. Two other Rear-Dump Euclids of the same capacity are utilized for overburden removal. In all, Luck is using 20 Euclids at his five quarries to keep production moving smoothly and steadily. Three out of four of all the off-highway haulers working at Luck's quarries are "Eucs."

Before you buy any haulage units, investigate Euclid equipment—it has reduced hauling costs on hundreds of mine, quarry and industrial operations. Your Euclid dealer will be glad to provide you a production-cost estimate for your operation as well as information on the complete line of Rear-Dumps, Scrapers, Bottom-Dumps and Crawler Tractors. Have him show you why ***Euclids are your best investment.***

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Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

PERSONALS *(Continued)*

The board of directors of Fairmont Aluminum Co. recently elected **Robert T. Farrell** as president and chief executive officer of the company, succeeding **Lawrence M. Brile,** who will serve as vice chairman during the interim prior to his retirement in February 1958. The company, which produces aluminum sheet, coil and circles, is a wholly-owned subsidiary of Cerro de Pasco Corp. Mr. Farrell has been associated with Fairmont since 1947. During the Korean conflict, while on leave of absence from the company, he served as an official of the aluminum sheet division of the National Production Authority. Upon his return in 1952, he was assistant to the chairman prior to his election as vice president of the company in 1955.

Farrell

Dr. Heikki V. Tuominen has been named associate professor of geology at Lehigh University. As chief geologist for the Finnish Ore Co. of Helsinki, Finland, Dr. Tuominen was engaged in magnetic and geologic prospecting in Finland and Lapland.

Dr. Oscar T. Marzke, formerly director of research at the U. S. Naval Research Laboratory, was appointed vice president-fundamental research of United States Steel Corp., effective Sept. 1. He returns to U. S. Steel after an earlier association in the company's research department of American Steel & Wire.

Recent appointments to two newly created posts were made by the Beryllium Corp., as follows: **William H. Santschi,** most recently supervising metallurgist at the Allegheny Ludlum Steel Corp. in Leechburg, Pa., to the position of associate director of research-fabrication metallurgy; and, **Kenneth B. Higbie,** formerly commodity specialist for beryllium with the U. S. Bureau of Mines in Washington, D. C., to the position of associate director of research-process and extractive chemistry and metallurgy.

Conrad W. Thomas, general mining consultant, has opened his office in the Bank of Southwest Building, Houston, Tex.

Charles E. Prior has been named mining director and elected to the board of Western Gold & Uranium, Inc. Re-elected to the board of directors for another year were: **Ralph G. Brown,** president; **David P. Shirra,** vice president and treasurer; **Edward Bierma,** general counsel; **Berene Backus,** secretary; **Richard W. Ince** and **Robert W. Bull, Jr.**

F. W. Archibald, former assistant manager of the Tacoma smelter, has been appointed smelter superintendent of the Southern Peru Copper Corp. at Ilo, Peru. The appointment was effective July 1.

OBITUARIES

Lynn Harrison Thompson, 69, president of Thompson & Murdock Investment Co., died Aug. 25, of pulmonary edema, in Salt Lake City. Former head of Ezra Thompson Co., founded by his father and early-day mining figure, Mr. Thompson had also been associated with Forced Underfiring Co., Kennebec Consolidated Mining Co., and Cardiff Mining & Milling Co.

Frederick Byron Hendricks, executive vice president of Kings Mountain Mica of Kings Mountain, N. C., died Aug. 13. He opened a mica mine east of Kings Mountain after World War II and after receiving world-wide recognition for his mica operations, opened a second mining operation near Kings Mountain.

William S. Stringham, widely known in the field of mining and metallurgical engineering, died July 31, following a heart attack. With Bruce Williams Laboratories, Joplin, Mo. for the past several years, he was head of the mining and metallurgical engineering department since 1946. He participated in the process for the recovery of manganese from low-grade and refractory manganese ores, and recently completed the successful operation of such a pilot plant for the General Services Administration of the U. S. Government.

Dr. J. B. Tyrrell, 98, an authority on the geology of Canada and discoverer of many of its leading gold mines, died in Toronto on Aug. 26. For 23 years, until his retirement three years ago, Dr. Tyrrell was president of the Kirkland Lake Gold Mining Co. Dr. Tyrrell's contribution to Canadian mineral development is marked by such milestones as the discoveries of the first coal and oil in Alberta, a prominent role in the Klondike rush and an array of gold finds in Northern Ontario. At the time of his death, Dr. Tyrrell was the oldest graduate of the University of Toronto and one of its most distinguished alumni. He was a senior fellow of both the Geological Society of America and the Geological Society of London, Eng. He was also honored by a number of governmental and professional organizations with the highest honors.

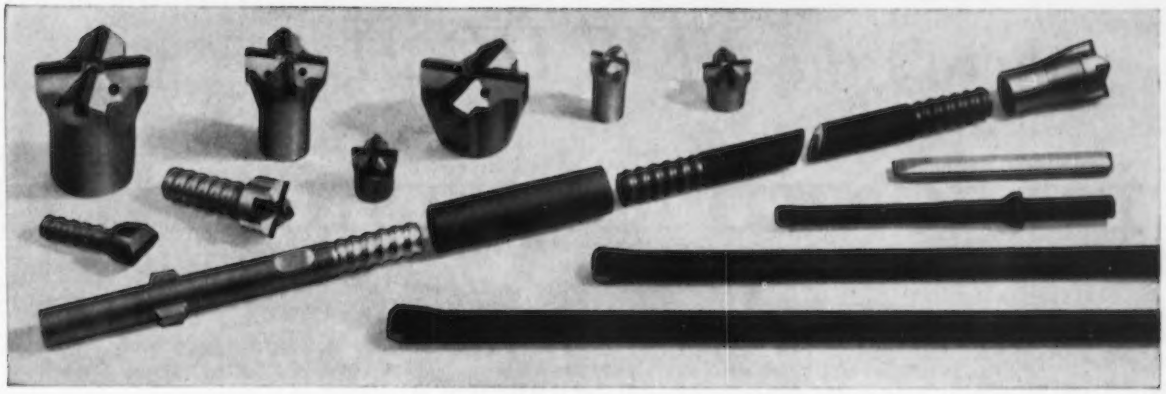
Will M. Traver, of Denver, Colo., a U. S. Bureau of Mines mining engineer who died last March, has been honored posthumously with the Department of the Interior's Meritorious Service Award and Silver Medal. Mr. Traver had nearly 17 years of Government service, all with the Bureau of Mines at Denver, except for about a year and a half with the U. S. Army during World War I. As exploration mining engineer in several Western States and as head of mining development for the Bureau, he discovered and developed lead-zinc ore deposits at Kokomo and in Ross Basin of the San Juan Mountains, in Colorado; antimony at Coyote Creek, in Utah, and mercury in the Terlingua district of Texas. In January 1955, Mr. Traver became executive officer of the Defense Minerals Exploration Administration field team, made up of representatives of the Geological Survey and the Bureau of Mines, in Region III.

Bong Ik Ahn, 47, president of the Korea Tungsten Mining Co., died Aug. 9, at his home in Seoul, Korea, after a brief illness. Active in mining since 1934, when he joined the Mitsubishi Mining Co., he was appointed director of the Sorim Mining Co. in 1946 and held that post until 1951 when he leased and operated the Wolak Tungsten Mine. Also in 1951 he was appointed managing director of the Korea Tungsten Mining Co., and became its president in 1952.

Dr. Roy Herman Kienle, 61, director of the research service department, Stamford Laboratories, of the American Cyanamid Co., died Sept. 2, in the Stamford Hospital (Conn.). Dr. Kienle was formerly director of applied research at the company's plant at Bound Brook, N. J. From 1919 to 1933, he was research chemist at the General Electric Co. at Schenectady, N. Y. During World War I, he served as a first lieutenant in the Chemical Warfare Service, and as a member of the advisory committee of the Office of Scientific Research and Development during orld War II. A native of Easthampton, Mass., he received a B.S. degree from Worcester Polytechnic Institute 1916, a Master's degree from Union College in 1927, and a Ph.D. in chemistry at Rutgers University in 1938. Dr. Kienle was onetime professor of Polytechnic Institute of Brooklyn. He was the author and co-author of many technical articles on coatings and related materials. He was also a member of the American Institute of Chemists, the Faraday Society, the Society of Chemical Industry, and other groups.

F. V. Richard, 45, manager of the Western Mining department of American Smelting & Refining Co., in Salt Lake City, died unexpectedly Sept. 5. Joining Asarco after graduation from the Mining College of the University of California, as an engineer and assayer at Tombstone, Ariz., Mr. Richard continued his service with the company until 1945 to spend two years assisting in a family business. In 1947, he returned as a safety engineer, and became manager of the Southwest Division in 1949, and Western Department manager in 1953.

Frank M. Rothrock, 87, pioneer Coeur d'Alene District mining man and last surviving member of the group which grubstaked the fabulous Hercules bonanza near Burke, Idaho, died in Spokane, Wash., July 3. He came west from Indiana in 1894, settling first in Wallace where he went into business as a butcher and meat buyer to supply the booming mining camps in the area, and then moved to Spokane in 1903. He was vice president and director of Day Mines Inc., the group which originated in the Hercules venture, until his retirement in 1955.



SANDVIK COROMANT—

A Complete Range of Drill Steel Equipment

You know as well as we do the advantages of buying all your drilling equipment from one supplier. These advantages become still more evident if you buy from the Sandvik Range. The Sandvik Steel Works are the world's largest manufacturers of tungsten carbide for rock drilling. Their production covers integral steels, detachable bits, extension steels and stone working tools—all made of high-quality Swedish alloy steel, all fitted with the well-known Coromant tungsten carbide inserts.

Integral steels with 50% longer life

Sandvik Coromant integral steels have up to 50% longer rod life than ordinary steels, thanks to anti-corrosion SR-treatment, which protects them during transport, storage and actual drilling. In addition, air-tight plastic caps give bit and shank extra protection during transport and storage. They are available in these standard sizes:—

$\frac{3}{4}$″ hollow hexagon	1′4″-13′1″
$\frac{7}{8}$″ hollow hexagon	1′4″-21′0″
1″ hollow hexagon	2′6″-21′0″
Flexible drill steels	2′7″-31′6″

Precision-made rock bits

The threads of Sandvik Coromant (cross and X-design) bits are precision milled. The bits are so accurately manufactured that not only smoother drilling but *longer life* are ensured. Standard bit diameter sizes range from $1\frac{1}{2}$″ to $4\frac{1}{2}$″. The 773 bits (bottoming type) are available with GD400 and GD600 thread, or with $1\frac{1}{4}$″, $1\frac{1}{2}$″ and 2″ rope thread. The 776 bits, for standard shoulder-type drill rods, are available with threads ranging from $\frac{7}{8}$″ to $1\frac{11}{16}$″.

Efficient extension steels

The rope-threaded joints of Sandvik Coromant extension steels are solid and make joining and unscrewing extremely easy. Sizes available: $\frac{7}{8}$″ and 1″ hexagon steels, $1\frac{1}{4}$″ and 2″ round steels. A special feature of the $1\frac{1}{4}$″ equipment is the $1\frac{1}{2}$″ flushing hole, about twice as large as most. This gives better cleaning of the bore hole and a higher rate of advance, reduces wear and risk of steels sticking. The 'cold rolling' technique makes this wider flushing hole possible *without any loss of strength.*

Wide variety of Stone Working Tools

A single plug hole steel made by Sandvik is capable of drilling up to 1000 holes, each about 3.9″. Sandvik Chisel Steels are made with rubber sleeves to reduce vibration and protect the worker. Sizes available: Plug Hole Drill Steels with bit diameters ranging from approx. $\frac{21}{32}$″ to $\frac{7}{8}$″. Chisel steels with bit diameters from approx. $\frac{5}{16}$″ to $\frac{23}{32}$″.

The World's foremost drilling unit

Sandvik Coromant extension and drill steels have been developed in close co-operation with Atlas Copco, manufacturers of rock drills and other compressed air equipment. The combination of Sandvik steels and Atlas Copco rock drills is the world's most widely used drilling unit—responsible for the drilling of more than one thousand million feet each year!

Write, phone or cable today for further details to any of the addresses below:

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DESIGNED AND BUILT TO FIT

Now . . . major advances make the Allis-Chalmers HD-21 more productive than ever . . . capable of handling big-tractor jobs of every kind with the efficiency and dependability all open pit operators want and need.

New 225-net-hp turbo-engine

New weight—45,500 lb (bare)

New power train and torque converter effectiveness, simplicity

New longer track for matched traction, flotation

New operating ease and control with work-saving decelerator

New heavy-duty matched dozers

Here's a big tractor you can depend on to help you on a wide range of stripping and maintenance jobs. Your Allis-Chalmers dealer will be glad to talk to you about the new "21" . . . and to prove its value in a working demonstration on your job. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

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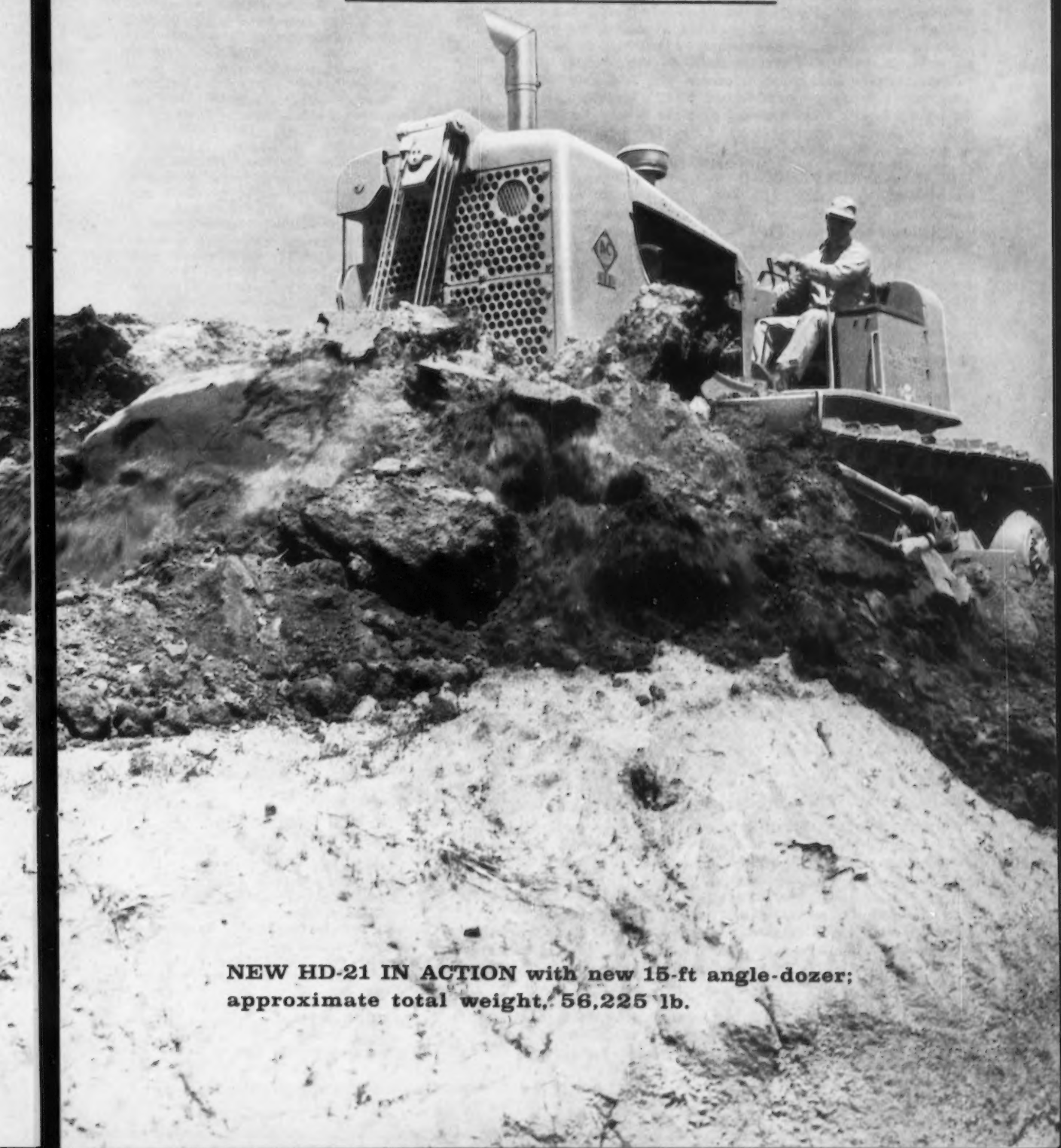
Engineering in Action

TODAY'S BIG-TRACTOR JOBS!



NEW HD-21 IN ACTION with new 15-ft angle-dozer; approximate total weight, 56,225 lb.

WASHINGTON IMPACT

Highlights

TO EACH HIS OWN—As U.S. metals and minerals industries step up their treasure hunt for precious markets in a tightening peacetime economy, their pressure on Washington for a Federal helping hand is becoming increasingly individualistic. Not only is each commodity group pushing its own solution to its particular problems, but producers and processors, big and small, domestic and international, are having difficulty presenting a united front even within a single commodity group.

There are Government mining experts who have long held that these industries (with the emphasis on the plural) are too diverse to share the same solutions even to similar problems. These officials are quietly noting some strong support for their theory in a number of recent developments in the field.

THE SEATON DOCTRINE—It's too early to stamp "failure" on this precedent-setting attempt to package a potpourri of Federal aids into a long-range support program aimed at over-all domestic mining. Nevertheless, Interior Secretary Fred Seaton himself repeated, as recently as three weeks ago at a press conference, his insistence that the program be kept flexible to deal with different problems in different ways as they come up. Thus Government incentive purchases, research and development activities, tax and tariff relief in the Seaton Doctrine—present or future—will be presented to Congress piecemeal and considered case-by-case, each on its own.

IMPORT RESTRICTIONS—The concerted drive for more protection from foreign competition is not new, though it is making new strides in Congress. But again, even though a general quota bill will be considered next session, this measure is most likely to be a sort of advance maneuver toward the acceptance of some specific quotas on certain items—commodity by commodity.

THE ABOVE two general efforts for over-all domestic mining support reflect the current situation facing several commodity groups:

LEAD AND ZINC—Only small domestic producers are united in a desire for higher tariffs. The larger mining interests with foreign operations and the domestic processors either want a small hike in the trade barriers, or oppose any boost outright.

COPPER—Domestic producers were up in arms over the fact that the Seaton Doctrine offered them no specific help. Tariff Commission offers no hope of relief either, because Congress has by law suspended even existing tariffs on imports. Sen. James Murray (D-Mont.) is preparing a bill authorizing new tariff increases, based on a 30¢ per lb peril point plus a cost of living escalator clause.

TUNGSTEN—In this case Government purchases came to an abrupt halt by Congressional action in specifically cutting tungsten out of the buying budget. Tungsten producers got the Senate to pass a resolution in the closing days of Congress calling for a Tariff Commission study of foreign competition. But there is not the political pressure and steam behind tungsten that there is behind lead and zinc.

FROM THESE AND OTHER ready-made examples, Government men are summing up the current picture with two main points:

- While a number of metals and minerals share at least one general problem in common—an economic readjustment from a Government-maintained wartime demand to peacetime condition—each one must be dealt with separately, according to its special circumstances.
- Those special circumstances are marked in a number of cases by deep divisions within the metals and minerals industries themselves as to the best way to handle any given problem facing a particular commodity.

If these points are proved out they will explain why first, no over-all industry-wide program will be adopted either by the Administration or Congress, and second, why it's so hard for Washington to come up with even specific recommendations on one metal or mineral.

Private Participation Urged for Foreign Mines

ONE WAY OUT of the problem of increased foreign competition for the domestic mining industries is for them to branch out overseas themselves. At least that's what a number of mining interests have started doing on a stepped-up scale recently—and Washington, for all its demure attitude toward other forms of Government assistance (see highlights column this page), is putting new emphasis on official help in this area.

When outgoing director John Hollister of the State Department's International Cooperation Administration talked of the Government's role in stimulating private investment overseas, he specifically singled out the extractive industries as particularly well-suited to this operation. Disregarding the intramural embarrassment Hollister's remarks caused State Department policy planners who still have to deal with foreign aid to Government-owned projects of some of our allies who are less acclimated to private enterprise, the thought expressed by the ICA director pinpoints a growing trend.

That trend is not only being pushed along by ICA, as Hollister indicated, but also by the new International Finance Corp., an arm of the World Bank. Function of IFC is to use funds subscribed by the governments of member nations (now running at the $100-million figure) to buy equity in private business in under-developed countries, as well as to make them loans. IFC then plans to sell its equity—at a modest but reasonable profit. IFC president Robert Garner thus sees his agency's role as a kind of finder and placer of private investment capital around the world.

The international agency made its first mining deal last month, a $2.2-million investment in Empresa Minera De Mantos Blancos, S. A., a Chilean corporation engaged in the development of a copper mine and smelter in the Antofagasta region of northern Chile. Mantos Blancos is controlled by Empresas Sudamericanas Consolidadas, S. A., a Panamanian corporation. Consolidadas holds the extensive mining, industrial, and commercial interests of Mauricio Hochschild and his associates throughout the countries of South America, North America and Europe. Corporacion de Fomento de la Produccion of Chile and other Chilean and foreign nationals have small investment interests in the enterprise.

The deal is part of a financial program totaling $12.8-million for development of the Mantos Blancos mine and smelter located 45 km northeast of Antofagasta, largest city and port of northern Chile, according to IFC. The ore deposit has been known for many years but the development of the property required new metallurgical methods for treating the ore and also an adequate and reliable source of water which became available only this year.

Hochschild interests have invested about $3-million during the past several years in defining the Mantos Blancos orebodies, and in engineering, through extensive pilot plant operations, a satisfactory metallurgical process. The proved orebody will now be developed and a metallurgical plant will be constructed to process 2,000 tpd ore, producing about 25-million lb of refined copper per year. Full-scale operation is expected by mid-1959.

Including the $3-million already invested in common shares by the stockholders' group, total capital of Mantos Blancos will amount to $12.8-million, of which half will be in the form of unsecured debt and half equity. The Hochschild group is committed to provide the total equity of $6.4-million and $2.2-million in debt. Financing the balance of the debt will be provided by $2-million from the American Overseas Finance Co. of New York and $2.2-million from IFC.

IFC investment of $2.2-million will be in debentures bearing interest of 7%, with amortization completed in 1968. The corporation receives option rights to purchase at par $1.1-million of Mantos Blancos common stock. In addition IFC may receive additional payments.

While the total share of U. S. capital invested in Mantos Blancos is relatively small, IFC president Garner told the World Bank annual meeting in Washington last month that he looks for more money to come from the U. S and Western Europe.

And even though South America is the most logical area for investment of that capital, Garner says other projects in the Middle and Near East and Asia are already under consideration.

The operations of ICA and IFC dovetail with a recent statement of U. S. Steel's Roger Blough, who predicts increasing internationalization of many large enterprises, especially including raw material mining.

Late Developments

DOMESTIC aluminum producers have agreed to deduct all imports from the primary metal they sell to General Services Administration under incentive purchase "put clauses."

HIGHER import tariff rates are being asked by five nations under current negotiations of GATT (General Agreement of Tariffs and Trade). The countries seeking higher rates are Canada, Austria, Ceylon, Greece and South Africa. While four of these are asking relief largely for processed goods, Canada is asking for relief on iron and steel blooms, cogs, ingots, rounds, squares, sheets, plates, bars, hoops, bands and strips, structural forms, pipes, tubes, pipe fittings and couplings (including casings used for water, natural gas and oil), and pressure pipes for pipelines, as well as pipe and valves used in drilling oil, gas, water or other minerals.

Labor This Month

MINE-MILL SHARES JOB PLIGHT: The International Union of Mine-Mill and Smelter Workers is hurting—almost as much as the industry that employs its members. The shutdown of lead and zinc mines has cut deeply into employment. Union officers see almost a repetition of the depression days of the 1930's. Everyone else is enjoying prosperity; Mine-Mill members are out of work. There's no tendency on the part of union officials to blame the industry; they feel closer ties now than almost ever before. Their lobbying tactics reveal this. They argue for price supports, against imports. This matches the industry's position. This time, compared with negotiation periods, it's a case of mutual concern.

The nonferrous downturn, says the union, has hurt this way:

- Since April there have been more than 8,000 layoffs in copper, lead and zinc.
- In Butte alone, more than 2,500 miners are jobless.
- Mines that have shut down for repairs haven't hired back all the laid-off workers. Workers who quit or are discharged are not being replaced.
- In the Tri-State area of Missouri, Kansas and Oklahoma some 1,100 workers are idle. And it's no better elsewhere in Mine-Mill territory.

A RE-ALLIANCE IN LABOR'S CAMP: If the Teamsters Union goes out of the AFL-CIO, by choice or otherwise, it's likely to take along some other unions. The giant trucking union holds the whip hand over numbers of other labor organizations because of its strategic control over trucking—if the goods don't move, plants don't open. This can work both ways. If the Teamsters ignore another union's picket line, a plant can operate. More than any other labor organization, the Teamsters can make or break a strike. With this influence, it's a small step for other unions, now outside the fold of the AFL-CIO to see their future on the Teamster bandwagon.

Other unions, threatened with AFL-CIO ouster due to corrupt influences, may team up with the Teamsters. These could be, among others, the ex-AFL textile workers and bakers unions. Construction unions, too, might go along on the theory that their interests are better served with the truck union than the AFL-CIO Federation.

Outside the fold already are some independent unions that might want to join—or may be invited to join a Teamster-led organization. Mine-Mill and Smelter workers, who came close to an informal alliance with the Teamsters' western division, might make it official. And the United Mine Workers union, with John L. Lewis at the helm, could be invited in. In almost all cases, the unions in such an alliance would be AFL-CIO recalcitrants; either expelled or facing expulsion, or just plain unhappy in the AFL-CIO organization.

WARFARE—PLAIN AND SIMPLE: A battle royal would be the outcome of a new rival labor organization. An AFL-CIO rivalry with a Teamster-run federation would bring back the jurisdictional battles of the past. It would stir some latent animosities. In the nonferrous industry, the currently-stilled struggle between Mine-Mill and the Steelworkers would most likely be reopened. Teamsters and Walter Reuther's United Auto Workers could clash. All truces, such as the no-raiding pact of the AFL-CIO, would be off. The build-up of union peace since the merger of the AFL and CIO two years ago would be out-the window except for those unions remaining in the federation.

If they can't avoid the split, labor leaders hope to avoid an open fight. But, with the bitter feelings that would be generated with the formal ouster of the Teamsters from the AFL-CIO on corruption charges, an outbreak would almost certainly come. There would be attempts to hold the line between unions at the local and state levels, but this would be blasted by the ouster of Teamsters from AFL-CIO jobs in their territories. It seems almost sure that troubles in the union camp would be intensified, day-by-day. That's why efforts will continue until the last minute to avoid a union break-up in the AFL-CIO.

In tough mining equipment . . .

WELDABILITY OF USS "T-1" STEEL

EVEN A HALF HOUR of down time on a big stripping shovel like this one is extremely expensive. So the owner, Tasa Coal Company, uses USS "T-1" Steel extensively to increase service life. Tasa has experienced no failures of USS "T-1" Steel even when it takes hard daily pounding at below-zero temperatures.

PAYS OFF IN BUCKET REPAIR

THE ORIGINAL BUCKET on Tasa Coal Company's 18-cu.-yd. stripping shovel was badly worn. The culprit, of course, was tens of thousands of tons of rock and dirt. So when new-bucket time came around, Tasa felt they could increase service life by building the new bucket in their own repair shop from tough, strong USS "T-1" Steel plate. Results have been excellent!

NO FABRICATING PROBLEM

The shop foreman told us that he had no difficulty welding USS "T-1" Steel. The welds have held up extremely well. After weeks of prolonged, hard service in sub-zero temperatures they show no signs of cracks.

OTHER APPLICATIONS

Tasa Coal Company has had good success fabricating USS "T-1" Steel for other parts, too. They weld ¾-inch USS "T-1" Steel plates, quenched and tempered to 321 minimum Brinell, to bucket teeth and thereby *triple* service life—increase it from just 5 days to 15 days.

USS "T-1" Steel has found a home in many mining applications. Its weldability and formability facilitate fabrication, while its very high yield strength of 90,000 psi and its amazing toughness and resistance to impact-abrasion help to reduce weight or increase durability.

WRITE FOR NEW TECHNICAL BULLETIN

Our new booklet, called "T-1," gives you much useful information on fabrication procedures and possible uses for this versatile alloy steel. Write for it today!

WELDING USS "T-1" STEEL plates to worn, cast bucket teeth. "T-1" Steel has *tripled* life of the teeth.

AUGER CUTTER HEADS get battered and abraded in really hard service. This entire head, except teeth and holders, was rebuilt by Tasa Coal Company with USS "T-1" Steel to insure good service life and to minimize repairs and maintenance.

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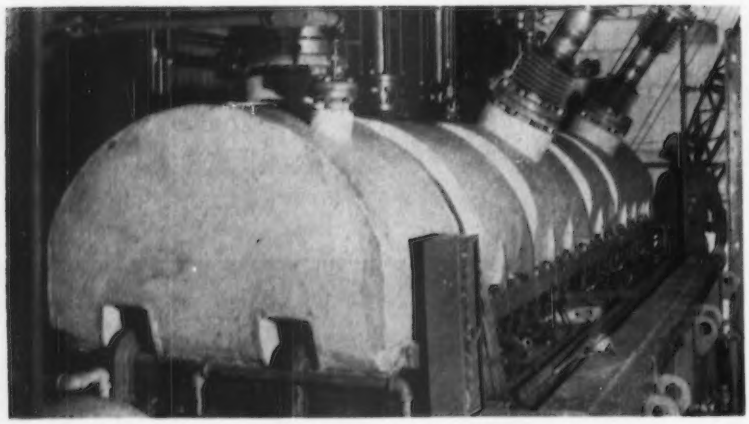
Watch the **United States Steel Hour** on TV every other Wednesday (10 p.m. Eastern time).

UNITED STATES STEEL



NO DOWNTIME furnace has replaced the batch furnaces formerly used.

Automatic Ovens Increase Hanford Output

Automatic ovens are speeding the production of uranium oxide at the Hanford atomic plant near Richland, Wash. Designed and installed by General Electric company engineers, the ovens are new type calciners which are replacing the old batch kettles in the production of uranium oxide.

Molten uranium salt is delivered into the calciners where high temperatures from electric heating elements bake the salt and reduce it to uranium oxide for shipment to other AEC sites.

Recovery of valuable unfissioned uranium from dissolved irradiated fuel elements, while secondary to the plant's main job of manufacturing plutonium, is considered a vital function at Hanford. The reclaimed uranium is processed and can be refined into metal for nuclear reactors, or into chemicals for gaseous diffusion plants. Until the calciners were perfected at Hanford, molten uranium salt was cooked in kettles or pots. Heat was supplied by electricity or propane gas and the molten salt was allowed to decompose into uranium oxide.

In such operations, the furnace frequently had to be cleaned.

The new calciner furnace is never down for unloading operations.

The oxide is discharged continually through a hopper while fresh molten salt pouring in from above maintains a constant balance in the oven. High temperature acidic gases escape through special filtered exhaust pipes and no one is exposed to radiation or radioactive contamination. Agitator paddles constantly stir up the mixture and prevent it from crusting on the sides of the oven.

Engineers combined high grade stainless steel with other design techniques to beat the corrosion and temperature problems. The result was a calciner that would stand up under temperatures of 1000 degrees F. and resist corrosion from acidic gases.

Philippines Invite Bids For Surigao Nickel

Invitations to bid for the operation of the billion dollar ferro-nickel government mineral reservation on Nonoc island in Surigao province was authorized September 10th by President Carlos P. Garcia.

According to Mines Director Benjamin Gozon, who was authorized by the president to publish the notice of the bidding, some 100 interested parties in the United States, Canada, Europe and Japan, will be sent copies of the invitations to bid.

Terms for the development of the reserve were prepared with the purpose of inducing private parties to invest the huge capital needed—estimated to run well over $100 million—and at the same time to assure an inflow of badly needed foreign exchange.

President Garcia stated to the cabinet that exploitation of the huge reserve, more than a billion tons of ore, would not be undertaken by the government since it is concerned with "a highly technical and most expensive process."

As incentives to private capital the following bidding conditions were offered:

1. The contractor may be authorized to repatriate within five years "from the first year of actual commercial production" not more than 80 percent of the foreign capital investments, plus interest, and to remit to non-resident investors abroad profits or dividends out of current annual profits or dividends.

Repatriation of capital, however, was based on a number of conditions.

2. The contractor may be exempted from all taxes, duties, fees and charges, both national and local, until 75 percent of the capital invested is recovered.

3. The contractor may export the mineral product in his operation provided that all domestic requirements for the same have been compiled with.

4. The contractor may be granted exemption from laws and regulations in the importation of machinery and supplies in connection with his operation.

5. The contractor may also bring highly specialized or technical personnel who may exercise their profession without examination while working on the mining project. The government also agrees that such imported personel may receive 50 percent of their wages in foreign exchange.

At the same time the government included guarantees aimed at improving the economic condition of the country while the mineral reserve is being exploited. This included a penalty clause if the contractor failed to have the reserve in "actual production" within five years of signing the contract.

The government also required it receive not less than 50 percent of the annual net profit from the operation, or not less than five percent of the gross quarterly receipts.

Bidders are required to post a bid bond equivalent to $250,000. The successful bidder will be required to post a performance bond of $1,500,000.

Although the contractor is allowed to select his own technical help, the government requires that preference be given to Filipinos in all types of employment in the mines if they are qualified.

One of the terms also provides that for every technician or specialist hired, two Filipinos be hired as understudies "if available and qualified."

Burma, Mawchi Mines Ltd. Form Joint Venture Co.

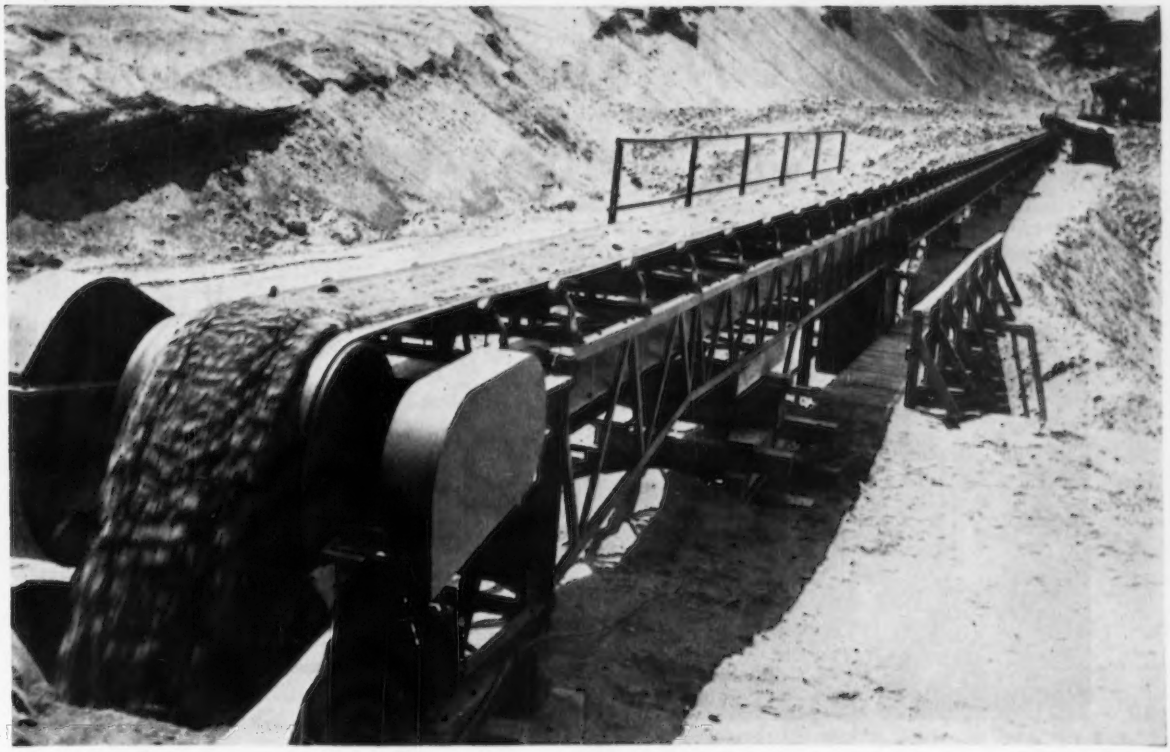
Government of Burma has agreed to participate in a venture with Mawchi Mines, Ltd., of London. Mawchi, a tin and wolfram operator in the Burmese state of Mawchi, is headed by Robert Annan.

Under the agreement, Mawchi will sell its assets to the new organization, to be called Joint Venture Co., and the government of Burma will purchase one-half control of Joint Venture Co.

Mallory, Sharon and National Integrate

P. R. Mallory & Co., Sharon Steel Corp. and National Distillers and Chemical Corp. have announced plans to form what was described as the largest integrated company in the field of missiles.

The new organization, Mallory-Sharon Metals Corp., would be jointly owned by the three firms. Plans call for Mallory-Sharon Titanium Corp. (now jointly owned by Mallory and Sharon) to ac-



LONG HAUL—Even the longest Barber-Greene Conveyors are built of standardized components . . . produced on a precision, quantity production basis. They can be assembled in almost limitless combinations to cut the time and cost of any material handling job.

Long or short haul—it costs less to move materials with belt conveyors

Thousands of installations—ranging from a few feet to thousands of feet—prove that belt conveyors move bulk material at lowest cost.

No other machine is so simple in construction or requires so little maintenance. No other machine can deliver such high hourly capacities with so little power or attention.

Barber-Greene has given a new meaning to belt conveyor economy. Built of standardized components, Barber-Greene Conveyors are delivered sooner . . . require less engineering . . . are erected faster . . . give top performance . . . and are more easily altered to meet changing or expanding requirements. Being standardized, repair parts are readily available—usually from the stock of your local distributor.

SHORT HAUL—Even the shortest Barber-Greene Conveyors are available in standardized components in the width and length to suit your needs. These small conveyors provide the economical way to handle the widest range of materials with greatest flexibility.

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

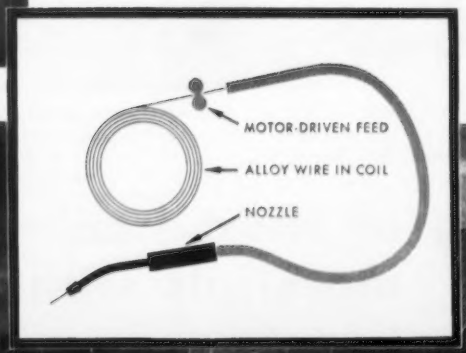
Semi-Automatic

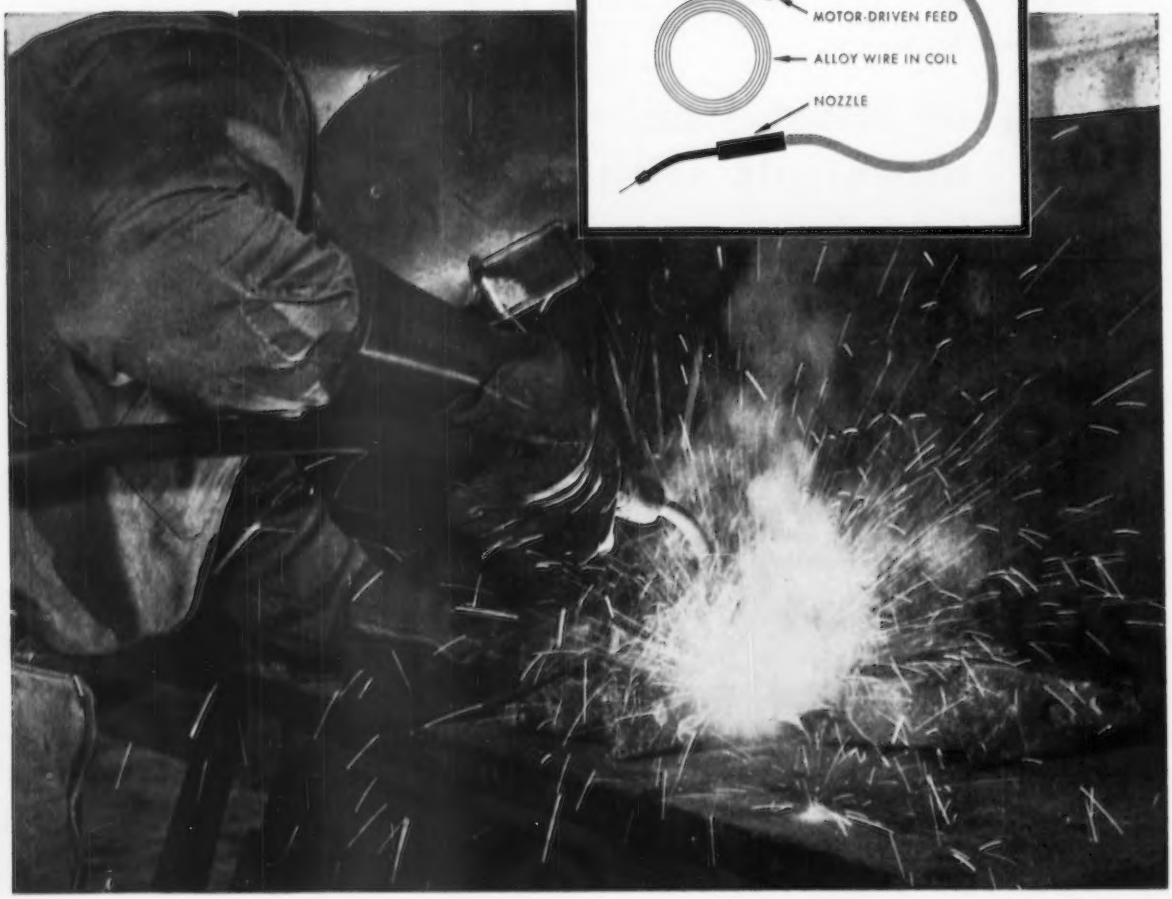
with STOODY WIRES

Takes the work out of welding—
speeds application—cuts overall costs!

How Stoody Semi-Automatic Hard-Facing Works

Stoody Wires are supplied in layer-wound coils for use on any automatic welding machine, with minor conversions. The wire is mechanically fed to the nozzle by a motor-driven feed roll and idler roll which are actuated when the arc is struck. The welder thereafter merely directs location of the weld deposit, the machine feeding the wire automatically as the arc is struck, stopping when the arc is broken.





Hard-Facing

Semi-automatic hard-facing with Stoody Tubular Alloy Wires is one of the greatest labor-saving processes yet developed for the maintenance man! It hustles you through jobs at speeds 2 to 4 times faster than manual welding. Wires are bare, need no flux or flux dams. Deposits are thus fully visible during welding... easy to lay along an edge or to a mark.

With Stoody Wires you get *low penetration*, this means less dilution and, consequently, a higher alloy content in the final deposit. Wear resistance is thus improved... usually superior to manual electrodes of similar analysis.

Finish on the wire is clean and bright, free from burrs and slivers, insuring smooth feed through the machine. Because the wires are drawn through special sizing dies after being formed they are concentric, true to diameter and uniform throughout their length. Special chemically coated papers protect against rusting and the fibreboard shipping container insures all shipments arriving undamaged, ready for use.

When you load your first coil of Stoody Wire you'll find the nylon wrapping especially handy—no heavy wires or straps to remove, yet the wire stays coiled till you're ready to weld!

Remember, with Stoody you get a complete range of proven, time-tested wires, from low alloy to high alloy types, plus a tungsten carbide... all backed by 10 years use in the field!

Nickel Manganese and Stoody 121 Wires are available in 3/32" or 7/64" O.D. Other alloys in 7/64" diameter only. All Stoody Wires feed through most semi-automatic machines with only minor changes in wire guides, feed rolls and nozzle.

For more information see your nearest Stoody dealer, 600 of them, in all parts of the U.S. and Canada (check the Yellow Pages of your phone book) or write direct.

STOODY COMPANY

11940 East Slauson Avenue
Whittier, California

Stoody 100

Applications... Crusher rolls, impellers in impact type crushers, bucket teeth and lips, scarifiers and rippers, tool joints, cement mill pulverizer rings and loader lips

Stoody 100HC

Applications... Catalyst piping, Banbury mixers, crushers and parts subject to severe abrasion

Stoody 102 *(for submerged arc application only)*

Applications... Cable sheaves, small diameter shafting, shovel idlers and equipment subject to high compressive loads

Stoody 104

Applications... Designed primarily for build-up of carbon and low alloy steels

Stoody 107 *(for submerged arc application only)*

Applications... Crane wheels, house rollers, mine car wheels, tractor and shovel parts subjected to severe impact

Stoody 108

Applications... Sprockets, shovel idlers and pads

Stoody 121

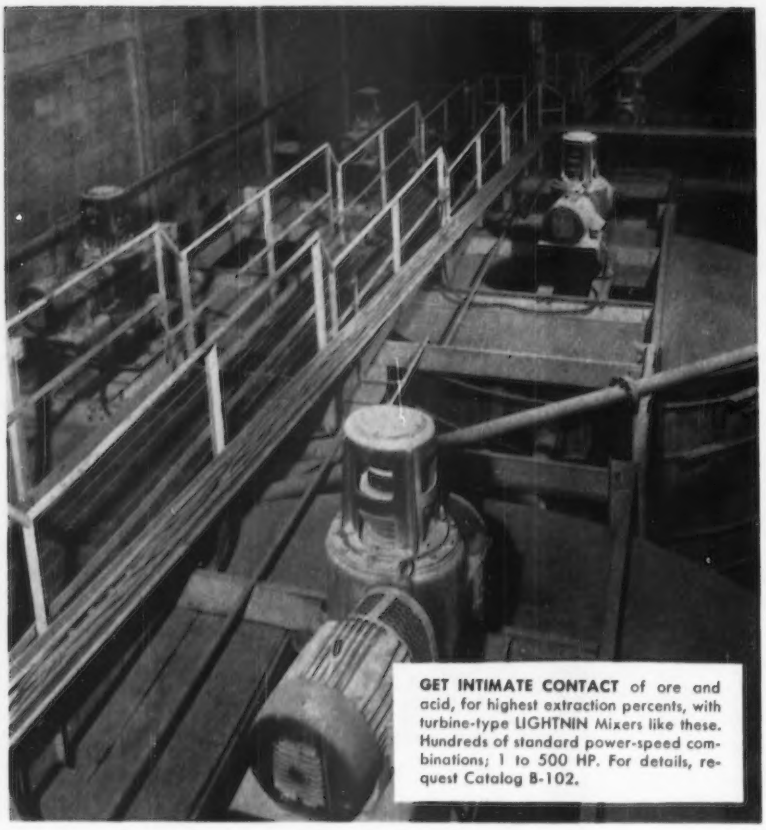
Applications... Crusher rolls, impellers in impact type crushers, bucket teeth and lips, scarifiers and rippers, cement mill pulverizer rings, loader lips

Stoody 130

Applications... Earth boring and scraping operations on equipment such as tool joints, augers, conveyor flights, scraper blades, rippers and concrete mixer paddles

Stoody Nickel Manganese

Applications... Strength welding and rebuilding of manganese parts



GET INTIMATE CONTACT of ore and acid, for highest extraction percents, with turbine-type LIGHTNIN Mixers like these. Hundreds of standard power-speed combinations; 1 to 500 HP. For details, request Catalog B-102.

Good mixing *helps push out half-ton per minute of U308*

More often than you might think, the payoff is in the *mixing* phase.

Good mixing of fluids helps this large Colorado plant extract uranium and vanadium with high efficiencies. The plant is designed for 30 tons/hr. of 75-80% U308 and 90% V205 concentrates, from ores averaging 0.2-0.3%.

In the dissolving tanks you see here, turbine-type LIGHTNIN Mixers put into the mix the *exact balance of fluid flow and turbulence* that will produce highest possible extraction values—by actual test.

LIGHTNINs do all these jobs

In the same plant, four LIGHTNINs mix crushed ore with leach liquor. Five others mix sand and ore slimes to prepare for releaching. Six more blend leach liquors.

Each unit is engineered specifically to do its job with maximum effectiveness.

Installation was simple, because all LIGHTNINs are shipped fully assembled, factory-aligned and ready to install. All are built of standard interchangeable components to keep maintenance and parts replacement simple. All parts are easily accessible for servicing.

Results guaranteed

Have you a tough mixing job to do? You can get a LIGHTNIN Mixer to handle it—with results *fully predictable, unconditionally guaranteed.*

For fluid mixing that helps you get more out of your ore, call your LIGHTNIN representative now. (You'll find his name in Thomas' Register.) Or write us direct.

"Lightnin® Mixers"

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 234-k Mt. Read Blvd., Rochester 11, N.Y.
In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 10, Ont.

Mallory *(Continued)*

quire all of the titanium and zirconium output facilities of National Distillers and the entire ownership of Reactive Metals Inc. (now jointly owned by National and Mallory-Sharon).

A joint statement by the presidents of all three companies said the new firm with assets of $55-million "creates a completely integrated special metals company with technical 'know-how' and facilities for every step from original chemical process to production and fabrication of finished products."

Syndicate Announces Baffin Is. Ore Find

An unnamed 18-man syndicate, represented by Robert Denner of Detroit, has announced discovery of an estimated 150-million tons of 25- to 30% Fe ore on Baffin Island. The group's 25,000-acre claim is in the coastal area bounded by Lake Harbor and Markham Bay. Denner refused to identify the principals, who, he said, put up $60,000 for initial exploration.

Charles Baker, geologist for the group, gave the grade of iron ore and also mentioned "promising finds" containing nickel and copper. According to Denner, the next stage in the venture is expenditure of $200,000 for full evaluation, followed by offers for sale if evaluation proves earlier findings.

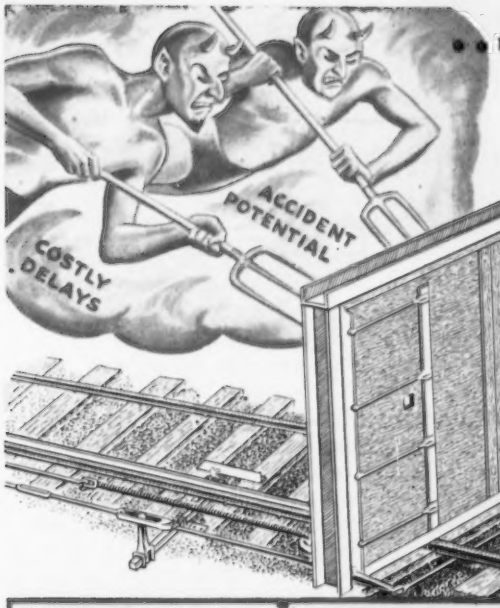
Bolivia Plans Revised Code for Mine Capital

Bolivia is planning a new mineral code designed to attract foreign capital participation on a royalty basis similar to that of the country's petroleum code, Walter Guevarra Arce, Bolivian delegate to the Tenth Economic Conference of the Organization of American States announced to a plenary session of that group last month.

The legal and technical complexities of the Petroleum Code boil down, he said, to the following formula: the net profits of oil operations are equally divided between the state and the private investor. This system, he said, has succeeded in bringing investments in Bolivian oil exploration and exploitation.

"Though it is premature to give definite details of the planned new mineral code," Arce said, "I think I may state that the possibilities of the royalty system are being studied as a simple and guaranteed form of participation by the state and the investors in the profits which may be obtained from the mining industry."

Senor Arce pointed out that Boliva's economy is almost entirely based on mining. More than 90% of its income in foreign exchange comes from the sales of mineral products and more than 50% of that, in turn comes from tin. The fluctuating world prices for these products, against constantly rising prices for machinery and tools, leave his country in a dangerous economic situation. A second grave national problem, the dele-



...You thwart two devils

with the AUTOMATIC AMERICAN MINE DOOR

ELIMINATE ACCIDENT POTENTIAL...
...CUT DOWN COSTS!

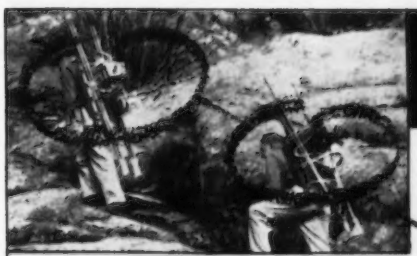
Automatically operated through weight of rolling equipment. Flys open—snaps shut. No attendant required. Trips travel at normal speed—no stopping or starting. Air power operated doors also available. "We estimate our labor savings at $750,000.00 since 1946 when we installed the first of 60 doors now in use." Challenge this statement. Name supplied on request.

The American Mine Door Company

2039 Dueber Ave. Canton 6, Ohio

The Automatic door mechanism that NEVER FORGETS - that NEVER DELAYS!

Other self-liquidating equipment — Mechanical Track Cleaner . . . Electric or Air-operated Track Switch Throwers . . . Air or Manual-operated Car Transfers—Wet or Dry Rock Dusters . . . Cable Splicers . . . Cable Vulcanizers. Write for descriptive brochures.



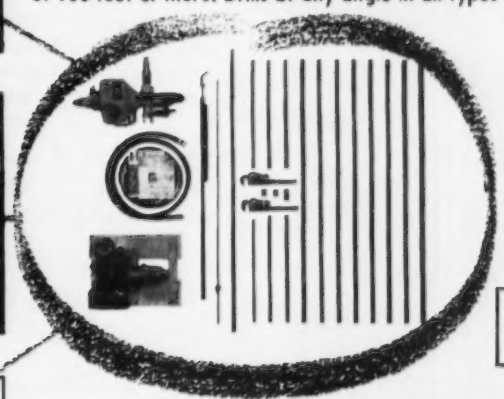
wherever you go!

however you go!

A TRULY PORTABLE DIAMOND CORE DRILL

The SUPER PIONEER

Here's a rugged, compact, lightweight drill you can take anywhere. The Super Pioneer eliminates guesswork by giving a true core sample to depths of 100 feet or more. Drills at any angle in all types of formations. Designed for one-man operation.



The complete outfit as shown being transported in pictures at left, with rods for drilling to a depth of 50', weighs just 159 lbs. Additional 5' rods weigh just 6 lbs. each. Accessories are available to meet any drilling requirement.

Send $1.00 for complete 24-page illustrated portable drilling manual.

Basic Kit, complete with drill and pump $885 F.O.B. Spokane. Rods and Bits additional.

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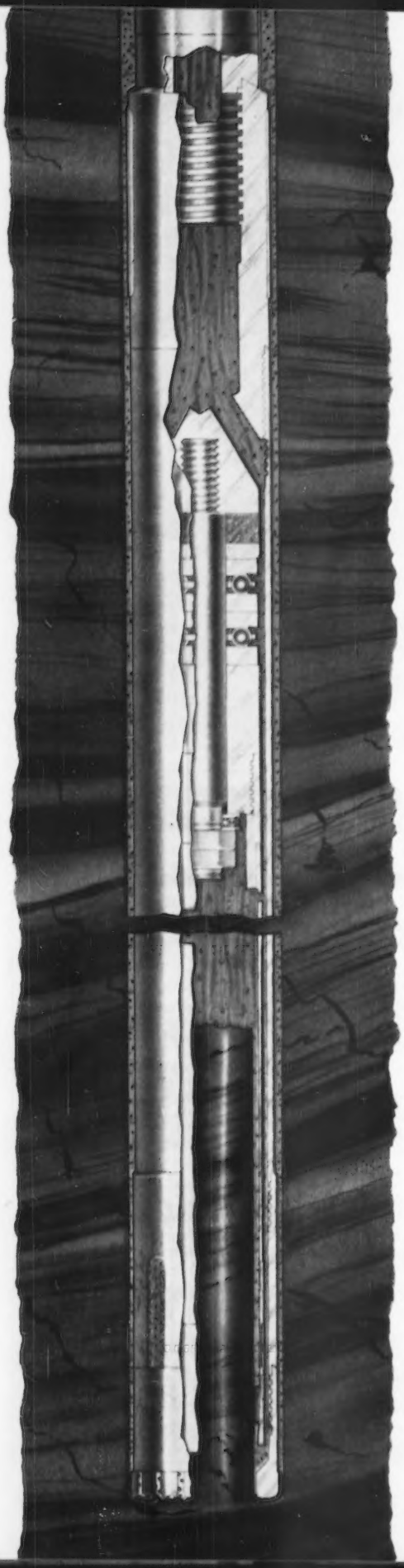

3 things make the Longyear "L" Series Barrel better than any other

Drillers using Longyear "L" Series Core Barrels *report better recovery in ground that is hard to core.* In one broken, unconsolidated ore zone, the "L" Series Barrel increased recovery from 40 to 89%, compared to results with another type of barrel. Some 15,800 feet were drilled with the "L" Series Barrels in this formation. Three things make the "L" Series Core Barrels better by drillers' standards:

1. With most other core barrels, slight wear and heavy downward pressure can cause belling at the joints. When this happens, the tools stick tight in the hole. *Bevel shoulders on "L" Series Core Barrels, bits and shells eliminate belling by greatly strengthening joints in the lower end.*

2. "L" Series Core Barrels have a slip fit between the core lifter case and inner tube instead of the usual threaded connection. No special tools are needed to separate them, so there is less chance of distortion. Consequently these vital parts *work the way they should longer.*

3. The Longyear Water Shut-off Valve eliminates errors in detecting a block. In closed circuit drilling (possible with Longyear Transmission Pumps), the driller gets a positive indication when a block occurs, and stops drilling before grinding of core starts. Thus, the Shut-off Valve improves core recovery and holds down bit costs, which soar when grinding takes place.

The Longyear representative in your area can tell you more about the advantage of the "L" series and other fine Longyear Core Barrels.

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CANADIAN LONGYEAR LTD., NORTH BAY, ONTARIO • LONGYEAR ET CIE., PARIS, FRANCE
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Diamond Core Drill Manufacturers • Core Drilling Contractors
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Who'd look for

Bolivia *(Continued)*

gate said, is the lack of sufficient capitalization. He pointed out that for more than 50 years prior to 1952, when the tin mines were nationalized, profits which sometimes were of great magnitude were totally exported from the country. Furthermore, he said, the operating capital of some important mining enterprises left the country during the course of the year 1952.

"We know that the economic development of our country can be financed only by public and private capital from abroad," Arce said. "We also know that private investment requires, first, the creation of conditions which will make them profitable."

Carpco Announces New Scheelite Separator

"HIGH TENSION" separation of scheelite, when associated with metallic sulphides, is possible without what the firm calls "costly flotation, roasting and magnetic separation procedures now in general practice."

Method, which follows conventional gravity separation methods with drying before separation, yields comparable of better scheelite concentrates, according to research director R. E. Barthelemy, and a clean sulphide product. In addition, Dr. Barthelemy points out, it can handle weathered ores as well as freshly ground.

BLM Speeds Up Handling Of Mine Claim Patents

Decentralization of the activities of the U. S. Bureau of Land Management has resulted in faster handling of applications for patent of mining claims. Heretofore, the applications were processed in Washington, D. C.

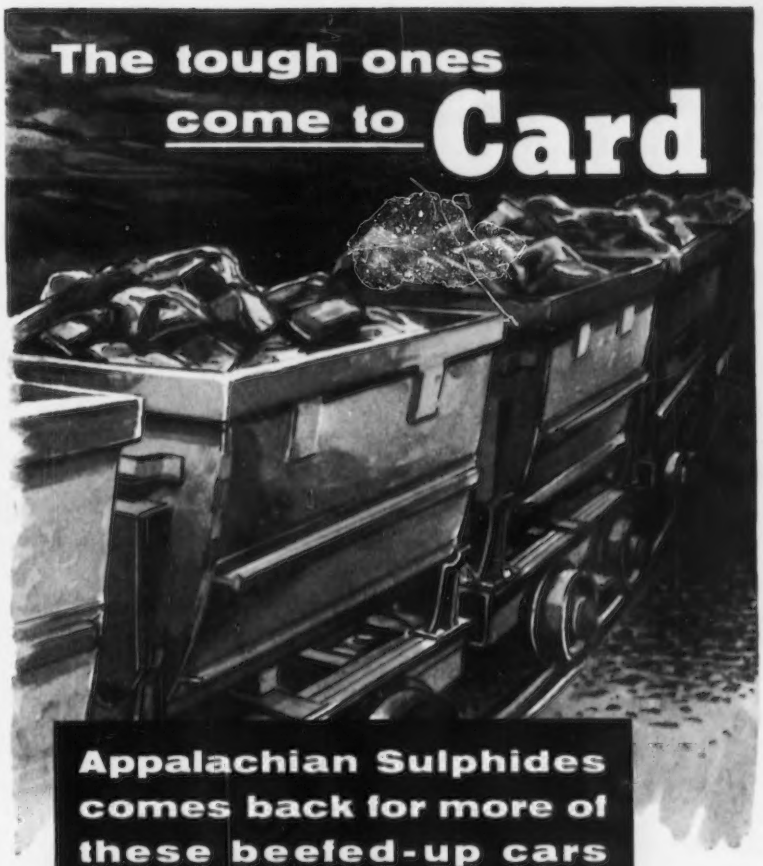
Of 46 such applications received from Washington in the past six months by the Salt Lake Land Office, all but four have been approved and patent issued. The remaining four were withdrawn.

E. E. House, manager, said the average "age" of the applications was 16 years. The last patent to be cleared up was on the claim of American Volunteer Mining Co., in the Brighton district, which had been kept active since location 62 years ago.

El Salvador Mucks With A 150-Ton Car-Slusher

Chile Exploration Co's El Salvador main haulage tunnel has been driven for one-third of its total length of 3.8 miles and is continuing at a rate of 40 ft per day.

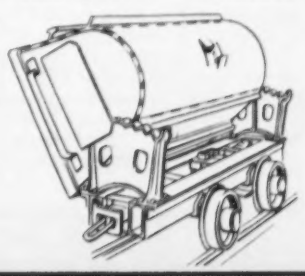
Using what may be the largest version of the slusher-ore car-loader combination (*E&MJ*, June 56, p 88) the Anaconda subdidiary moves 150 tons of rock from the face in one step. An Eimco loader (1½-yd deisel) discharges into the first of three 50-ton cars where a rail-mounted slusher takes the load and pulls



Appalachian Sulphides comes back for more of these beefed-up cars

Within a five year period Appalachian Sulphides, Inc., (formerly Vermont Copper Co.) has purchased 42 Card Rocker Dump Cars on four successive orders. The heavy sulfide ore is side-loaded by rocker-shovel, placing unusual strain on the cars. Card engineers worked closely with the customer to produce a 40 cubic foot car which does not break down under this service.

The result is a car body of low-alloy high-strength steel plate, mine rail reinforced, and a frame nearly three times standard strength with proportionately heavy rocker pedestals. It includes the new Card safety locks. Our engineers are always willing to work with you for the right solution to some particular haulage problem. Standardize your haulage with an economical Card design.

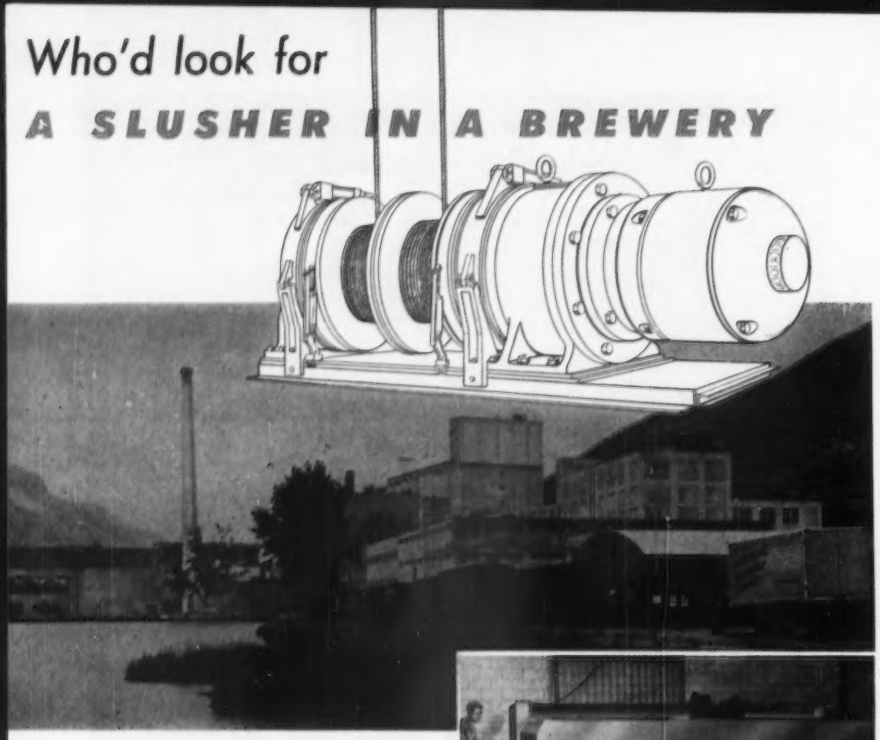


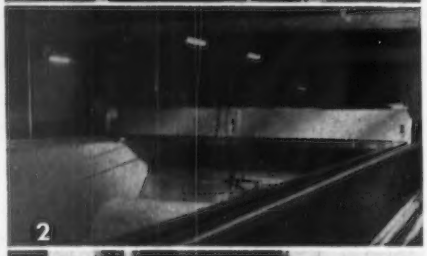
C.S. Card Iron Works Co.

2501 WEST 16th AVE.
DENVER, COLORADO

Who'd look for

A SLUSHER IN A BREWERY





As this series of pictures shows, a Vulcan DSQ-20 Slusher in this modern brewery faces unusual and difficult service from an engineering standpoint. The brewery is using a rail-mounted Slusher (4) under the floor of the malting room to handle a special Company-designed scraper to empty the long Malt Compartments (2) after germination. The grain passes through a floor slot (3) onto a conveyor below the scraper. At both levels, humidity is always 100% and exposed wearing parts within the malting room are of stainless steel, including the ⅝" pull and ½" tail rope. The slusher motor is totally enclosed and the slusher itself has internal seals which bar the excess moisture.

The slusher is hot dip galvanized on exposed steel surfaces. Integral hydraulic controls (1), (4) are used for safety and convenience in remote operation. With a different compartment to be emptied early each morning by a single slusher, controls and cables must be easy to hook up and the complete installation must operate with absolute cleanliness. If you have difficult or exacting specifications for slusher operation, expect the ultimate in Vulcan-Denver performance. We invite your inquiry.

See these new controls in our latest Slusher Catalog No. DB5709

VULCAN IRON WORKS CO.

IN DENVER SINCE 1891

2960 SOUTH FOX
ENGLEWOOD, COLORADO

El Salvador *(Continued)*

it back to the last car and continues loading forward. Jumbos drill another round while the three cars are being bottom-dumped. Face is ventilated for removal of gases and deisel fumes.

IN THE U.S.

ALASKA

Klukwan iron ore pilot plant turned out its quota of concentrate for the summer and ceased operations some time ago. Churn drilling is still continuing on deposit's placer portion. The work is being done by U. S. Steel.

Kendrick Bay Mining Co. is mining the Ross-Adams uranium lode pretty much on schedule. The road was completed, and trucks are now hauling from open pit operations at the rate of about 400 tpd and stockpiling on the beach. Stockpile presently amounts to over 8,000 tons, and shipment will be by barge when a larger stockpile has accumulated.

Placer operators have been hard hit for water this year in scattered districts throughout Alaska. Abnormally dry summer has held some miners down to a few minutes' sluicing a day and in some of the larger operations, it has been difficult to keep dredge pond levels up.

ARIZONA

Arizona has decreased mining property valuation in the state by $7,150,000. This brings assessed valuation of mines down to $245,920,940 compared to $299,435,-022 last year.

Largest of the mining decreases was $5-million for Kennecott Copper Corp. Second largest reduction was $1-million for American Smelting and Refining Co.'s Silver Bell unit in Pima County.

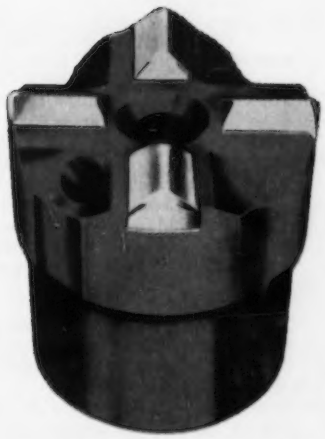
One increase was ordered—$50,000 in the case of F. A. Sitton, owner of part of the American Manganese Co. mill in Mohave County.

Vast chalcopyrite orebody has been reported in explorations of Becchetti Copper Corp. south of Jerome, with test drillings showing deposits ranging from 8 to 23%.

Mike Warren, Becchetti general manager, said extent of the copper ores has not been determined. Sierra Diamond Drilling Co. has been doing exploration work on apparently rich thorium lodes in the Becchetti holdings.

Dixie Queen Mining Corp. has announced immediate development of what it terms a $25-million beryllium and other minerals discovered in Yavapai County.

John Phillips of Phoenix, corporation president, says geological and geochemical exploration done by Einar C. Erickson of Orem, Utah., shows beryllium and



PATENTS APPLIED FOR

A TUNGSTEN CARBIDE INSERT BIT

"Used to destruction without need of resharpening"

LIDDICOAT

PROVEN SUCCESSFUL IN ALL PHASES OF DRILLING

UNIQUE DESIGN

The LIDDICOAT Bit was developed as the answer to a long felt need for a tungsten carbide insert bit designed to give fast cutting performance . . . long cutting life . . . low initial cost . . . low cost per foot drilled. A bit that can be used to destruction and then be discarded thus eliminating costly labor and equipment necessary for resharpening. Provided in the design are unique features which cannot be designed into the conventional multi-use bit which has to be resharpened.

EFFICIENT CUTTING ACTION

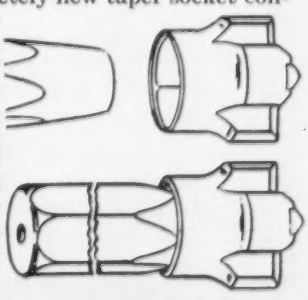
The design of the bit and inserts is such that even when dulled a reverse taper does not occur. In the conventional multi-use carbide bit, a reverse taper stops drilling. The four-point bit permits fast collaring, fast cutting, and easy removal from the hole. In spite of these many desirable features, this bit is offered at a new low first cost, which provides low cost per foot of hole drilled. In examining the Liddicoat Tee Cee Bit, you will note the shallow tungsten carbide insert (patents applied for). It is the design of this insert that provides the unusual performance of the Tee Cee Bit. Liddicoat Tee Cee Bit drills far beyond the average dulling point of the multi-use carbide bit.

FORGED FOR TOUGHNESS

The Liddicoat Tee Cee Bit body is produced entirely by forging. By a patented and exclusive manufacturing process, the hot alloy steel is subjected to tremendous pressure which extrudes the steel in the desired shape.

TAPER SOCKET – NO THREADS – FAST, FIRM ATTACHMENT

The type TS Tee Cee Liddicoat (no resharpening) bit has a completely new taper socket connection. Within the socket of the bit is a brass shim. The socket, which is completely forged, is tapered to correspond to the taper placed on the drill rod. The connection assures an absolute attachment to the rod, and yet permits easy removal.



WESTERN
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Open Top and Sides Permit:
1) Continuous Inspection
2) Easy Accessibility

See how easily you can observe every phase of the operation of this open-type heavy-media vessel, and how readily it can be maintained. Then investigate: (1) Its simplicity; entire process is performed by one moving part; little to go wrong. (2) Its quiet pool surface with large productive separating area. (3) Its unique drive; no power transmission trains. (4) Its low installation cost. Examination will disclose this vessel's substantial economies in production and maintenance. Models for all HM needs.

Our pilot plant houses commercial-size HMS system

For details of OCC Vessel's unprecedented simplicity, Send for HMS Bulletin. Pilot plant testing service

THE ORE & CHEMICAL CORP.
DIVISION: MINING & MILLING MACHINERY

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Arizona *(Continued)*

recoverable amounts of mica, bismuth, strontium, zinc, nickel, and yttrium.

Dixie Queen holdings are in the Weaver Mountains 35 miles southwest of Prescott and first were worked as gold holdings in 1917. Erickson says his report shows 160,000 tons of high-grade beryllium in four claims. Assays run from .11 to 11.40%. Phillips said a planned flotation mill will recover most of the minerals. Open pit operation is planned in the area.

Dasco Mines Corp. of Yuma has opened the first 200-ton unit of what will be a 400-tpd daily flotation mill and sintering plant at Wenden.

The site is in the center of what is claimed the nation's largest deposits of low-grade manganese, serving Northern Yuma and southern Mohave counties. It is just a few miles from the Government's $15-million stockpile of unmilled manganese ores.

Arizona mining men foresee that the mill might result in reopening of many of the low-grade manganese operations which suspended operations when the Government stopped its stockpiling program.

Along with Dasco's 200-ton flotation unit is a 6-hearth Mace sintering plant which will sinter a carload of concentrates a day.

Primarily, Dasco plans to handle only its own manganese ores—from the Manganese King, Black Band, and Doyle Manganese. The finished grade of manganese at the mill-sinter plant is expected to result in concentrates of 46-48%. Robert L. Kidd is in charge of the operation.

CALIFORNIA

An executive of Standard Oil Co. of California says that oil shale will be the next material used by his firm in synthetic fuel development. The forecast came from R. G. Follis, Standard of California board chairman. He stated, also, that no timetable has been set to put his company into the race to develop the estimated 1,000-billion barrels of oil locked in the shale cliffs of Colorado, Utah and Wyoming. He pointed out that his company has the largest holding of oil shale in Western Colorado and Eastern Utah.

"Be assured that when the time is ripe we'll be in it," Follis said. "We've been watching Union Oil Co. of California for some time and we have some ideas of our own on retorting and mining."

Tryout of a gold-dredging machine fed by skin divers "vacuum cleaning" the bottom of the Kern River 35 miles northeast of Bakersfield recently was reported "highly successful."

Inventor of the nautical vacuum dredger is Eugene A. Spangler, Maywood. Machine is mounted on a three-foot-high metal frame and supported by two pieces of ski-shaped steel. A circular steel drum containing about 10 lb of mercury filters the gold from river-bot-

Here's MORE efficient driver speed for HEAVY Loads

ALLIS-CHALMERS TEFC Wound-Rotor MOTORS

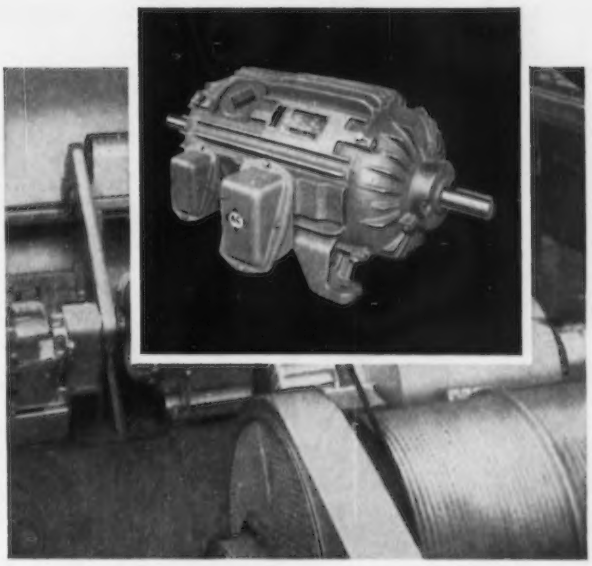
Where high inertia loads must be accelerated quickly and smoothly — yet power supply is limited — the Allis-Chalmers wound-rotor motor proves its efficiency . . .

High starting torque with this motor requires relatively low line-current. In addition, adjustable acceleration and running speed are possible through use of simple controls.

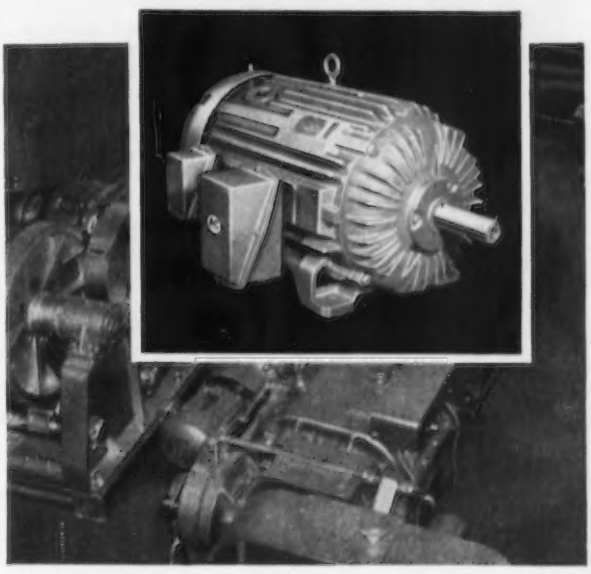
Other features of the TEFC wound-rotor motor include:

1. **Rib construction** provides ample cooling surface.
2. **Single enclosure** surrounds stator, rotor, slip rings, brushes and brush rigging. Gives maximum protection in moist, dirty, corrosive or hazardous atmosphere.
3. **Cast-iron frame** contributes rigid, distortion-free bearing support and keeps alignment true.
4. **Easy access** to collector rings and brushes permits on-the-spot inspection of brushes and commutators.

If you use hoists, lifts, cranes, conveyors, crushers or mills, find out more about the "MORE" in Allis-Chalmers wound-rotor motors. A-C motors also are available in various open types. Contact your nearby A-C sales office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



For intermittent duty, this totally-enclosed, non-ventilated model is available in frame sizes 284 to 505 inclusive. Above 505 frame, Allis-Chalmers offers its famous tube-type motor.



For continuous service, this tough, fan-cooled model is ideal. All enclosed motors can be furnished in standard enclosed or explosion-proof construction rated 55 C rise.

A-5180

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BAGS

The EXPLOSIVE bags with 4 big advantages

- Super tough . . . resist abrasion.
- Water-resistant . . . work in a damp hole.
- Intuck design, with cemented-seam . . . they round out when filled and won't hang in the hole.
- Economical . . . the low cost will surprise you.

Bemis BANG Bags are made of the same material as Bemis Waterproof (laminated-textile) Bags, proved through years of use in many industries.

Need burlap overslips for explosive bags . . . or multiwall paper explosive bags? Bemis is your best source of these, too.

Write or wire for samples, prices and complete information.

Bemis

408-E Pine St., St. Louis 2, Missouri

California *(Continued)*

tom sand. The machine has three speeds, and sand is fed through a vacuum hose extension similar to those used for domestic purposes. Production figures were not released by Spangler and his skin divers.

Withdrawal applications covering 465,399 acres of public land in California have been filed by the Federal fish and wildlife service.

If withdrawal is allowed it would mean no mining claims could be filed on the 15 parcels of land involved. However, mineral leasing under 1947 Materials Act could continue.

The land is now administered by the Bureau of Land Management, and if it becomes wildlife area, it would continue under BLM control.

Of particular interest to miners are four areas proposed for withdrawal 62,000 acres at New Idria, a highly-productive quicksilver and chromite area; 49,000 acres at Panoche, also a quicksilver region; 56,000 acres at Temblor and 58,000 acres at Caliente—both of which have been the scene of uranium exploratory activity. Hearings were to be held early in October on these four areas and McCain Valley, Mt. Dome and Cinder Cone parcels.

Other parcels are at Klamath River, Clear Lake, Copco Lake, Madeline Reservoir, Biscar Reservoir, King Peak, Otay Mountain and Jacumba.

A gold and platinum mill is to be put in operation soon by Mesco Co. and L. H. Robertson near Mojave, according to a recent company announcement. A well has been developed on the site originally claimed by Bruce Menard. Menard sold his claims to Bob Thompson, Thompson sold to H. D. Ramsay and Cecil Caldwell who in turn sold to Mesco Co. and Robertson. Caldwell and Ramsay are to receive $40,000 plus 10% royalty for the property, according to reports.

West End Chemical Co. recently started operations at a 5-mile-long open-pit limestone mine in Panamint Valley, it's reported. A new 12-mile Inyo County road leads to the mine.

Abandoned Joe Walker Mine on Piute Mountain near Caliente, 30 miles east of Bakersfield, is providing irrigation water for 170 acres planted by Vern Scheli. The 350-ft shaft, developed between 1866 and 1942, was abandoned when it filled up with water faster than miners could pump. In seven peak years of operation, the mine produced more than $600,000 in gold ore, the present operator reports.

In Sacramento, Natomas Co. reported it has shut down one of its gold dredges in the Folsom district, after 20 years of service.

Reserves are running out, the company said, but it estimates three remaining dredges can be kept going at present rate until 1960.

Firm took in $679,921 from bullion sales during the first six months of this year, and net income—including its activities outside the mining field—amounted to $346,672.

U. S. Department of the Interior has given David H. Kenison of Lancaster permission to placer mine for gold in the Richbar region of lower Kern River Valley. Pacific Gas & Electric Co. representatives said they would oppose Kenison's request for use of river water in his operation when he applies to the proper state authority.

PG&E has a power generator at mouth of river a short distance downstream from Kenison's Surprise mining claim, filed on 40 acres last year under a Federal law permitting placer mining in power reserve areas under certain conditions.

Conditions include restoring the surface to pre-operation conditions and posting a $10,000 performance bond before start of operations. Activities would cover a five-year period.

PG&E's protest to department examiner John A. Wood was dismissed on grounds that the law under which request was made is not concerned with stream conditions. Kern County Fish and Game Protective Assn. also unsuccessfully opposed the Richbar development on grounds that it would spoil the river for downstream fishing and picnicking. The Forest Service also filed a protest at the hearing held in the Bakersfield post office.

Kenison said he would draw water from the river for two placer machines,

ALLUVIAL DEPOSITS

Gold-Tin-Columbite-Ilmenite-Bauxite Rare Earths

Most accurately and economically tested for . . . with the

EMPIRE DRILL

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USS FORGED GRINDING BALLS

hit a New High in performance!

New manufacturing facilities at U. S. Steel have now made possible forged steel grinding balls with three outstanding characteristics:

HARDNESS

The hardness patterns obtained in USS Grinding Balls assure superior grinding qualities and long service life in all types of grinds.

TOUGHNESS

To resist breakage, each size and type of USS Grinding Ball has the maximum toughness compatible with its depth of hardness.

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The exacting controls that are necessary in processing, particularly heat treatment, combined with frequent laboratory checks, insure consistency in quality—ball to ball and load to load.

There are two types of USS Forged Steel Grinding Balls available: USS Carbon-Manganese, for most mill operations, and USS Alloy Steel, for unusually severe grinding conditions. Both types are manufactured in the same sizes: ¾", ⅞", 1", 1¼", 1½", 2", 2½", 3", 3½", 4", 5". To find out what makes the "good" grinding ball *you* need, send for our new free booklet, today. Just fill out and mail the coupon.

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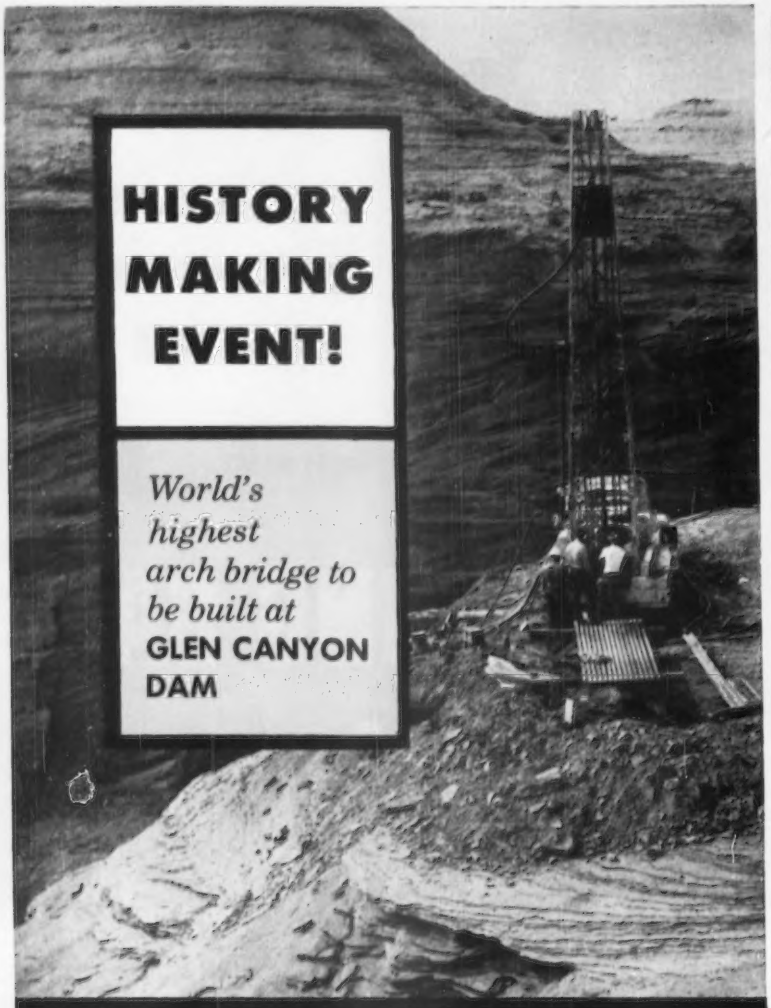
UNITED STATES STEEL



Complete core recovery essential for proper foundation testing of this multi-million dollar project

The most important primary phase of the Glen Canyon job is foundation investigation. The use of Christensen matched diamond coring equipment for this project proves the versatility and superiority of Christensen diamond core bits and barrels because they give the operator complete, accurate information from the best possible cores. Whether it be foundation testing for the world's highest bridge or any mining or construction problem, there is a Christensen diamond core bit and barrel designed for you. Call the Christensen engineer, whose background and experience make him well qualified to offer reputable, dependable consultation and service, and help you operate at "less cost per foot."

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CHRISTENSEN DIAMOND PRODUCTS

1937 SOUTH 2nd WEST SALT LAKE CITY, UTAH

California *(Continued)*

with safeguards to prevent water from being spoiled in any way.

COLORADO

Revised schedule for uranium ore purchases at AEC buying stations at Riverton, Wyo., and Grants, N.M., became effective July 1, the AEC's Grand Junction Operations Office announced Aug. 29.

New schedule states no payment will be made for any constituent of the ore except U_3O_8, and that no ore will be accepted that is not amenable to processes in use at mills operating in the Riverton and Grants areas.

AEC's statement said virtually none of the ores delivered to the buying stations involved contains vanadium in recoverable quantities and none of the tributary mills is equipped to recover vanadium.

The statement said also that ores bought at Riverton and Grants will be purchased only pursuant to terms of contracts providing for minimum specifications, rate of delivery, and total quantity of ore to be purchased during term of each contract. No contract will be entered into for a period exceeding one year, the statement said.

Grand Junction Operations Office on Aug. 28 announced cancellation of the copper schedule for copper-uranium ores purchased at Monticello, Utah, effective Sept. 1. Experience has proven the average copper content of ores in the Monticello area is too low for economical recovery. No copper-uranium purchase contracts were in effect at time of the schedule cancellation, although some ore of that type had been purchased previously.

Plans of Ohio Oil Co. and Arthur E. Pew for building a uranium mill to process lignite ores in North and South Dakota have been deferred indefinitely, the AEC's Grand Junction Operations office was officially informed early in September.

Operation of the mill would not be feasible at the ceiling price of $10.50 per lb of U_3O_8 concentrate, the Commission was told, and construction plans have been delayed "pending development of improved ore processing or a greatly increased demand for uranium oxide."

Productive uranium mining lands in the west end of Montrose County—including much of the Uravan mineral belt—were assessed this year at $3,581,485. That figure represents an increase of $1,202,470 over the 1956 valuation of uranium claims in the area, County Assessor James L. Hamilton said.

Valuation of mining equipment and machinery in use in the uranium industry in Montrose County jumped to $3,210,170 this year, more than double the 1956 valuation of $1,483,957.

Uranium lands assessed totalted 52,549 acres.

Uranium stands out as the brightest spot

At Steep Rock Lake, Ontario, dredge pumps lined with Lukens "T-1" steel (321 min. Brinell) remove two million cu. yds. per month.

Rock, Gravel Crash Through World's Most Powerful Dredges; Lukens "T-1" Steel Adds 33% to Liner Life!

TRADEMARK

Dewatering of this Canadian lake by Caland Ore Company, Ltd., will permit open-pit mining of hematite ore.

In dredging operations, impact and abrasion combine with brutal force to give pump liners expensive beatings. In the world's most powerful dredges, Lukens "T-1" steel now slashes this expense for Construction Aggregates Corp., agents for Caland Ore Co., Ltd.

With order after order, Lukens "T-1" steel is lasting 33% longer than the abrasion resistant steel formerly used.

Whether you handle stone, coal, or metal ores, Lukens "T-1" steel used in the areas hardest hit by punishing abrasive impact will save you money, too. It has tripled the life of rock driers. The 321 minimum Brinell quality has been known to outlast previous metals by 18 to 1 in quarry wear plates. Chutes, hoppers, and mine cars are other typical applications.

And Lukens "T-1" steel retains its remarkable combination of hardness and toughness at temperatures well below zero. Send for our informative, illustrated booklet, "Lukens 'T-1' Steel." Write Manager, Marketing Service, Room 958, Lukens Steel Company, Coatesville, Pennsylvania.

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Helping industry choose steels that fit the job

Sauerman News Briefs

SPECIAL EDITION OF SAUERMAN NEWS

Brief items about the Sauerman Method... Crescent DragScrapers Slackline and Tautline Cableways... Durolite Blocks

Sauerman Bros., Inc. • 626 South 28th Avenue • Bellwood, Illinois, (Chicago Suburb)

Waste Disposal by Tautline-Scraper

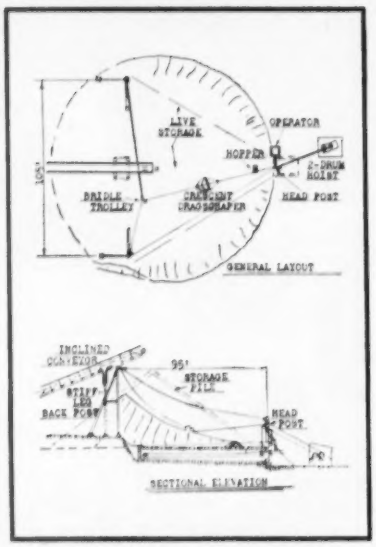
A Foote Mineral Company plant is using the Sauerman Method to solve a difficult sludge removal problem. A 2-yd. Tautline-DragScraper has proved to be ideal for the job. The sludge is handled safely and efficiently—men or machines need not travel on the material, since only the DragScraper and cables enter the disposal area.

The DragScraper distributes the sludge from the discharge point to a natural valley about a thousand feet long by several hundred feet wide. It is connected to a 2-wheeled plate carrier which runs on a track cable between the headpost and one of the tail masts. The operating cables permit the DragScraper to be hoisted free of the material—a great advantage over conventional hauling methods. A Sauerman 3-drum hoist provides DragScraper power.

(Condensed from Sauerman News No. 148.)

Reclaiming Material to hopper from all sections of a 500-ft. warehouse, the estimated operating cost of this DragScraper Machine is 2.1 cents per ton. *(Sauerman News 145).*

Rapid Shifting DragScraper is Engineered to Needs of Silica Sand Producer



The Sauerman Method was successfully applied to the requirements of a prominent silica sand producer, as shown in the drawing above. This Rapid-Shifting DragScraper Machine reclaims raw sand from a 6,000-ton stockpile.

The pile is formed by an inclined conveyor leading from the floor of the quarry to the live storage area. The Crescent DragScraper reclaims from storage to a hopper-fed conveyor in front of the head post.

Before the DragScraper was installed, the raw sand frequently bridged across the hopper. Such interruptions in the flow of raw sand to the plant resulted in costly shutdowns. The Crescent prevents this bridging action and provides a steady flow of material for processing.

The Sauerman Method also permits the company to build up a reserve pile of raw sand sufficient for at least one week's production as insurance against a quarry shutdown.

(Condensed from Sauerman News No. 147.)

MORE NEWS AND INFORMATION

Issues of Sauerman News giving greater detail about the installations on this page are available on request. For full information, tell us your interest or requirements and ask for catalog. Contact Sauerman Bros., Inc., 626 S. 28th Ave., Bellwood, Ill.

Colorado *(Continued)*

In the present western mining picture, executive secretary Robert S. Palmer of the Colorado Mining Assn. said, following a meeting of the association's executive board in Durango Aug. 30.

Few of the "big men" of the uranium industry are concerned about that metal's long range future, although a production drop is likely when the Government's guaranteed price program is halted in 1962, Palmer said.

The Durango conference was largely concerned with the problems facing the lead, zinc and tungsten producers.

Executive board members and directors of the state Metals Mining Fund agreed on appointment of a joint committee to study a natural resources program proposed by Gov. Stephen L. R. McNichols. Palmer will name the committee.

Construction of a 100-tpd capacity mill is under way at the Superior Mines Corp. property at Bonanza, Saguache county. Foster-Smith, superintendent, said that the mill should be in operation in a few weeks and that the company will do custom milling. Company now is working underground at the Rawley mine, removing lead, zinc and copper ores. A total of 48 men are employed by Superior Mines at this time. In addition to the miners, eight men are employed in the mill construction and will be working at the mill when it is in operation.

T. R. Llewellyn, vice president of Westminster Corp., has announced that the company has acquired all assets of Xtabay Mining and Uranium Co. of Dallas, Texas. In this latest purchase, expanding Westminster Corporation gained possession of 260 acres of gold properties in the Rofa mining district near Yuma, Ariz. and 260 acres of mining properties in Fremont County, Colo., which, according to preliminary exploration and sample assays, indicate potentially high content of rare earths mineralization and 420 acres of potential uranium ore-bearing properties, also located in Fremont county.

At the present time exploration and development is under way to prove up the rare earths and uranium properties.

Rehabilitation of the two-mile long Big Five tunnel at Idaho Springs will, if results justify, assure the construction of a mill near the tunnel portal. Work has been in progress for some time under the direction of the Contract Engineering Co. of Denver, of which Al Hoyle is the head, with Arthur Wood in personal charge of the work. Work now has reached a point 5,750 ft in from the portal, where caved-in ground is being penetrated, with the ultimate objective point in the old tunnel some 3,950 ft further in, where there is reported to be a body of ore containing gold, silver, lead and copper. Company backing the project is Ventures, Ltd., of Toronto, Canada.

In order to solve the ventilation problem, Franklin & Cowan, of Ozona, Tex., have moved a drilling rig to a site near the top of Virginia Canyon, some 1700 ft

The only REVERSIBLE cap and adapter made...

Try this on- for SAVINGS!

Service-proved WEARPACT Cap Type Tooth —with foolproof retainer—cuts digging costs to record lows . . . even in taconite!

Probably by now you've heard of Wearpact Steel—the alloy with a combination of hardness and toughness not available in any other commonly used alloy.

Here's a new tooth and adapter design* cast in longer-wearing Wearpact . . . the ASF Cap Type Tooth and adapter —the *only* such tooth and adapter that's reversible for longer life. Note that the tooth itself is self-sharpening. Keeps on *slicing* through the ore and overburden—and when finally worn, there's less metal to throw away. *The tooth locks securely to the adapter.* No ASF retainer has ever failed in service.

As for service life, the cost-per-ton figures in large mines speak for themselves. Lowest of any tooth on record! Give this dollar-saving tooth a try! Write today to arrange for an installation.

Cut your costs with WEARPACT

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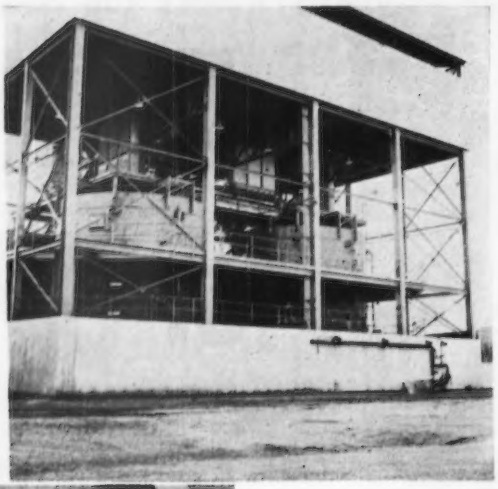

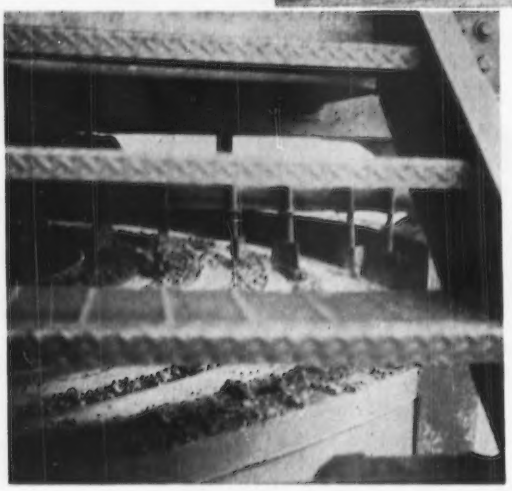

Installing 3, 23'-6" I. D., 4-Hearth Units

Photographs show a typical installation of two C.I.W. 23'-6" I. D., 4-hearth Skinner Dryers.

At this plant...

SKINNER DRYERS

- each unit is drying over 20 tons/hr. of copper sulphide concentrates
- reducing moisture content from approximately 15% to 9%.

Based upon successful results like this, another large copper company is installing Skinner Dryers.

experience...proved performance

Skinner...proved for 38 years for efficient roasting and drying of ores, clays, limestone, lime sludge...including sulphide roasting; oxidizing, reducing and chloridizing roasts.

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A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.

Colorado *(Continued)*

above the Big Five tunnel, and have started to drill an 8-in. hole down to the tunnel, to be used as an air shaft. The cost of drilling is expected to be around $30,000 to $35,000.

Prospect that the Cripple Creek gold district may someday develop into a uranium center looked possible as the Cotter Corp. continued its exploration of Four Mile Hill, six miles north of Cripple Creek. George West of Guffey, manager of the Four Mile operations, states that the company has drilled twenty-one holes so far to a depth of 60 to 80 ft. Each hole has shown uranium of a commercial grade, averaging about .60% uranium.

The uranium ore is autunite and shows about 2 ft thick and is approximately 10 ft below surface. Cotter is now exploring the possibility that larger quantities of the ore might be found at greater depth. At present, the company has two drill rigs in operation. A crew of five men has moved into Cripple Creek to do the work.

Stripping of overburden has begun on the open-pit uranium operation in the Talahassee Creek mining district near Canon City. Property has been farmed out by Juniper Oil & Mining Co. of Denver to the Cotter Corp. of Santa Fe, N.M. Cotter Co. has a permit from the AEC for the construction and operation of a uranium processing mill near Canon City, with the AEC contracting to take the product of the plant for the first year.

According to K. W. Lentz, Trace Elements Corp. plant manager at Maybell, the new processing plant will mark the first establishment of uranium industry in Moffat county. Lentz was assistant plant manager at the Union Carbide Nuclear installations at both Rifle and Uravan.

It is expected that the mill will start full operation by the latter part of September, working three shifts daily.

Robert G. Risk of Indianapolis, Ind. president of Leadville Lead and Uranium Corp. says his company has completed, as a part of its exploration and development program, approximately 6,000 ft of drifting and raising. Lundberg Explorations, Ltd. of Toronto, recommended the program being carried out.

"More than $1-million has been spent on the acquisition of the large Leadville property holdings and their development to date. We feel that we are well along with our program, which could make the east side of Mosquito Range, just over the hill from Leadville, an important new mining district," concluded Mr. Risk.

Bassick gold mine near Silver Cliff, Custer County is being reopened by Reynolds Minerals Corp. of New York and Denver, according to information. Old records indicate that the Bassick produced about 3.5-million tons of gold-silver ore, from 1877 to 1914, some of which was of quite high grade, and that as of 1921 its known resources were about 350,000 tons of $11.60 ore.

Gold receipts at the Denver mint in July

In carrier landings, planes coming in at more than 100 knots are stopped in a split second. This amazing performance is made possible by having each plane hook onto one of several wire ropes stretched across the flight deck. Both plane and rope receive an almost unbelievable shock at the moment of contact. Needless to say, only top-quality wire ropes can be used for this application because . . .

you can't bargain with safety

While your use of wire rope differs from this carrier application, *safety should be just as important to you.* For, although a "bargain" rope may save you money, it can cost you your peace of mind. So don't bargain with safety. Buy a rope that's a *quality* rope—buy Wickwire Rope. 5049

WICKWIRE ROPE — A CF&I PRODUCT

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LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
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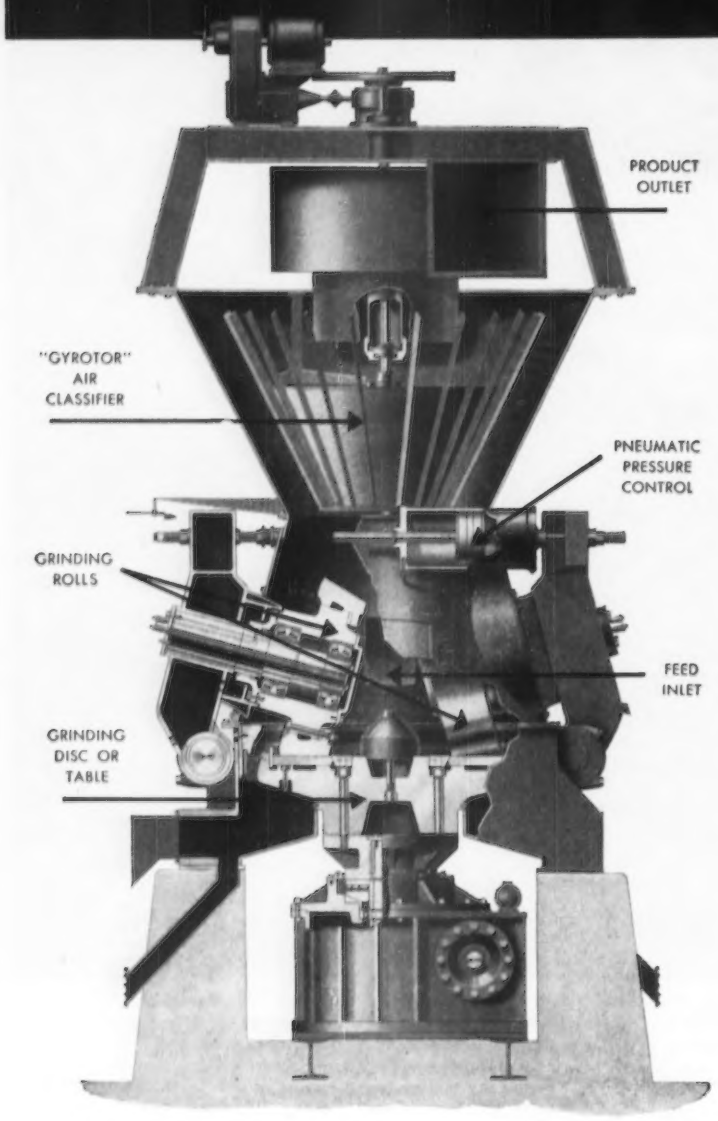
New York • Philadelphia

DISC-ROLL MILL



The Hardinge Disc-Roll Mill is a roller-type mill with two adjustable, pneumatically loaded rolls for grinding material on a horizontal rotating disc or table (Loesche type). The Hardinge "Gyrotor" Air Classifier, in combination with the mill, provides a complete grinding, classifying, and drying system. A full description is given in Bulletin 52-I.

HARDINGE
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Colorado *(Continued)*

totaled 73,082 oz worth $2,557,870 compared with 69,987 oz worth $2,449,556 in July 1956 mint officials report.

Silver receipts were down to 16,415 oz worth $14,834 from 539,556 oz worth $488,313, reflecting the continuance of the world price above the fixed U. S. Government price of 90½c an oz.

New Idria Mining & Chemical Co. owner of large mercury and tungsten properties in California, has a $53,444 U. S. loan contract for uranium exploration in Mesa County. Government's share is $40,083.

IDAHO

Shaft-sinking got underway at the Clayton Silver Mines property in the Bayhorse District of Custer County in early August under a $130,840 DMEA contract. Project will involve 300 ft of shaft work, from the 500 to the 800 level, and about 2150 ft of tunneling on the lower horizon to open both the North and South orebodies.

Current progress in the shaft bottom is at the rate of about 1 ft per day, with work on a one-shift basis, to eliminate interference with production which is continuing at the rate of 100 to 120 tpd.

Development of the North orebody on the 500 level for mining is largely completed, but the ore shoot has been found to be considerably longer on this horizon and development of this north extension is still in progress.

Recent development work in the Ontario-Stewart (northwesterly) sector of the Bunker Hill Co.'s big Bunker Hill Mine at Kellogg has disclosed a very promising new lead-silver structure which compares in grade and character with some of the richer type orebodies mined at the property in earlier years.

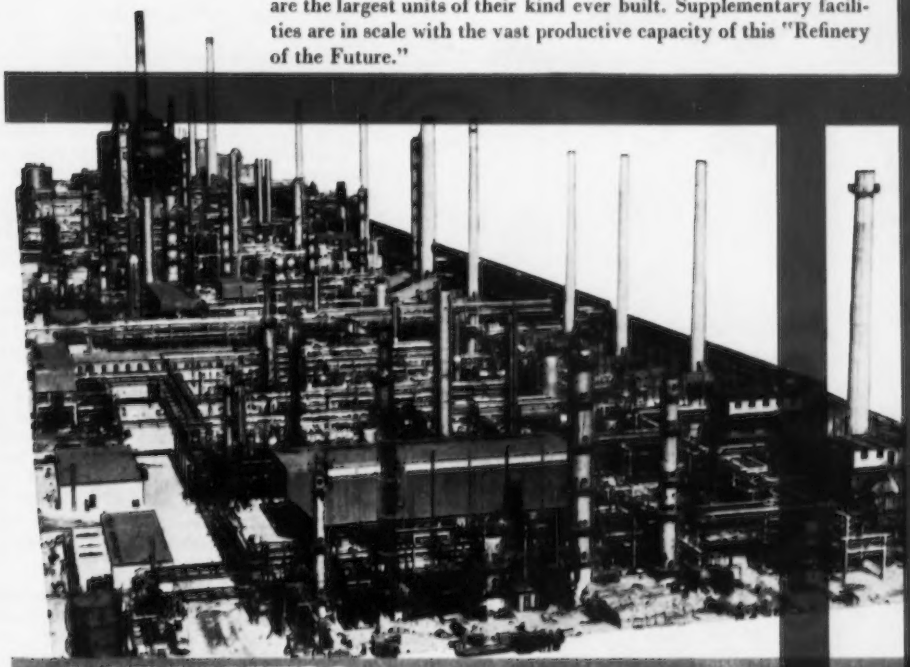
The new vein was encountered unexpectedly in a northerly exploration crosscut being driven on the No. 11 level toward the old Senator Stewart property, under an operating agreement with Silver Bowl, Inc., owner of the Stewart claims. By mid-August it had been exposed for a length of about 150 ft and showed good quality lead-silver ore for the entire distance, with widths ranging up to 20 ft.

Sunshine Mining Co. will hold a special meeting of stockholders in November to consider a number of organizational changes, including a 1½-million-share increase in capitalization, the board of directors has announced. Purpose of the stock increase is to provide for future growth of the company through use of the shares to acquire new interests, and generally improve the firm's flexibility and maneuverability in new ventures.

In addition to its big silver-lead-copper mine in the Coeur d'Alene District, Sunshine now has oil interests in Washington, Colorado and Alberta, Canada, a uranium property in southern Utah, and a number of exploration ventures, including a mercury prospect in Alaska and a copper prospect in Arizona.

TIDEWATER—builds for the future

Tidewater Oil Company's new refinery near Wilmington, Delaware, is the largest refinery ever built as a single project. It has a total capacity of 130,000 barrels per day. Its crude unit, Orthoflow fluid catalytic cracking unit, fluid coker and 45,000 BPD Houdriformer are the largest units of their kind ever built. Supplementary facilities are in scale with the vast productive capacity of this "Refinery of the Future."



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Catalytic's record in maintenance of refineries and other industrial plants has won it the maintenance contract for this gigantic new Tidewater enterprise. It assures Tidewater Oil Company of professional engineering type service that works in coordination with Tidewater's own staff. It means a minimum, highly productive, flexible force on the job only as required . . . with qualified mechanics available for turn-around periods.

Catalytic's contract maintenance service means more profits and less operating expense. Write for information on Catalytic Contract Maintenance.

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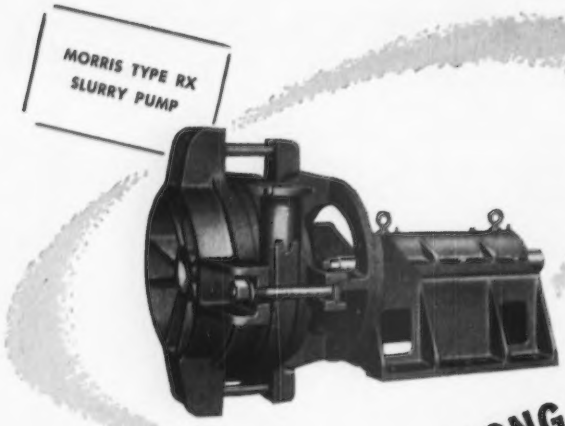

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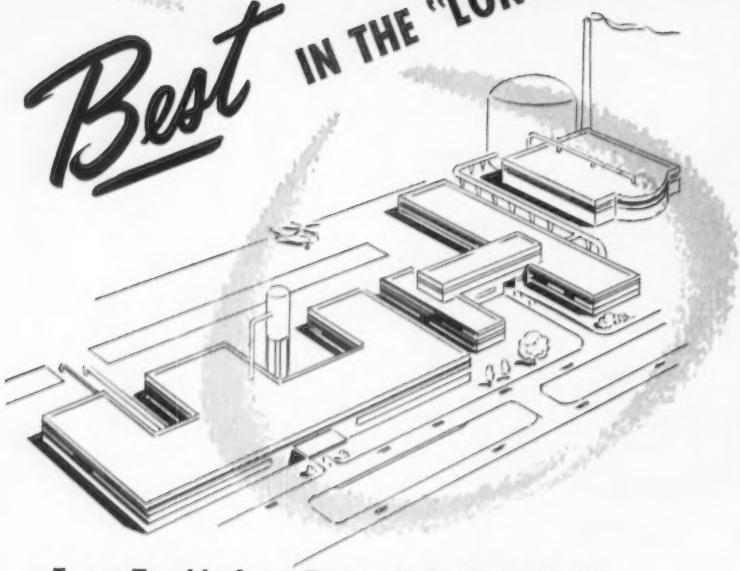

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Idaho *(Continued)*

Its recent discovery well near the Pacific Ocean in Grays Harbor, Wash., has checked out satisfactorily in initial production tests and gives every indication of being a commercial producer with a rating of about 200 barrels a day. The company plans to drill three more wells in the area this fall.

Other organizational changes to be voted upon at the November meeting will be an increase in the board of directors from 5 to 15 members, a broadening of the stated purpose of the corporation to cover a wide variety of enterprises, a clarification of the authority and duties of directors, and extension of the corporate existence of the firm from its present expiration date in 1968 to perpetuity.

E. L. Jones and Associates have installed a screening jig at their iron ore property on Iron Mountain in Washington County and are now considering the addition of equipment for magnetic separation. Ore shipments from the operation have been going to Oregon Steel Mills in Portland.

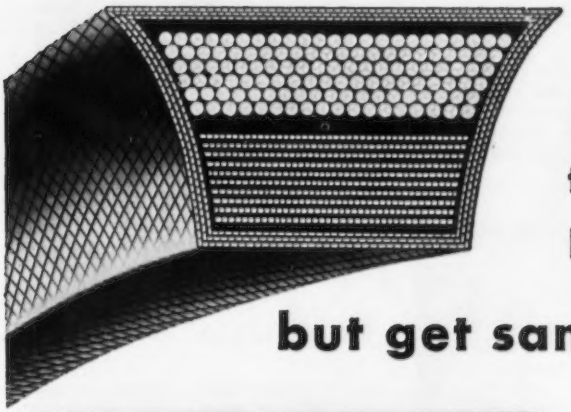
Idaho's first carload of high-grade uranium ore was shipped during the second week in August by Western Fluorite Co. of Warren, Ark., from its leased Little Bill property in Custer County about 18 miles northeast of Stanley. The ore was trucked to a siding near Hailey and sent by rail to Vitro Uranium Co.'s processing plant at Salt Lake City. Exploration and development of the claims, owned by Bill Brooks, Juhl Kauffman and Melvin Peterson, all of Hailey, is continuing and substantial additional production is anticipated.

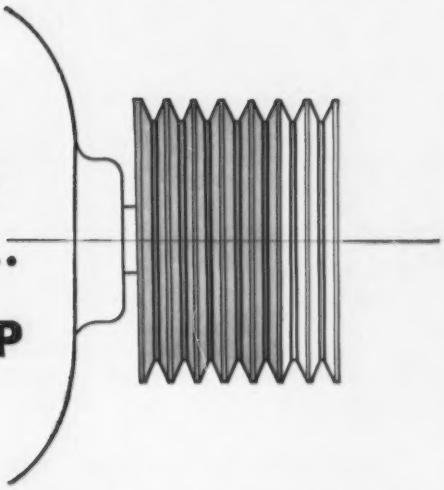
Rock Island Gypsum Co. of Weiser has started production from the gypsum deposit formerly operated by Northwest Gypsum Co. at the mouth of Rock Creek in Washington County. Two grades gypsum soil conditioner are being produced and stockpiled—one with a guaranteed 13.5% sulphur and the other a higher-grade product made by an upgrading process suggested by the University of Idaho school of mines. The Rock Island firm, headed by Kenneth Steck, holds a lease on the deposit.

Lucky Friday Silver-Lead Mines Co.'s orebody is proving to be as rich and as big on the new 2450-ft level as on horizons immediately above. The first 520 ft of east drift on the structure was in high-grade ore all the way, averaging a strong 5 ft in width. Westerly drifting is now in progress, and the east heading will be continued as soon as ventilation pipe has been installed. Ore shoot was about 1200 ft long on the 2300 level.

Golden Ridge Uranium Co. announced recently that it is planning to construct a new-type uranium processing plant in southern Idaho about 110 miles north of Pocatello to handle carnotite ores mined from the west slope of the Bitterroot Mountains. The plant will utilize a recently-developed and still unpatented milling process devised by Charles Herrington, Salt Lake City engineer, company officials said. Negotiations are now

5 Gates Super Vulco Ropes do the work of 7 standard V-belts





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Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.

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Cut sheave width and weight . . . design your drive to benefit from the greater HP capacity of Gates Super Vulco Ropes.

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Idaho *(Continued)*

in progress with the Atomic Energy Commission for a concentrate purchase contract. The company is headed by Karl M. Pratt of Salt Lake City.

A special exhibit depicting the Bunker Hill Co.'s complex operations and displaying some of its products has been presented by the company to Idaho Governor Robert E. Smylie for permanent display in the Capitol Building at Boise. The exhibit consists of four automatic picture projection machines with screens about the size of a 27-in. television set which show a sequence of 30 color slides on company operations—in the mine, the concentrator, the lead smelter and the zinc plant—when started by a push button. It also includes a display case of metal product samples—refined pig lead, special high-grade zinc slabs, high purity cadmium and some extruded and milled products from the firm's fabricating division.

MICHIGAN

M. A. Hanna Co., who in October 1956 announced that they had retained the Bechtel Corp., San Francisco, to carry out engineering and design studies of the Groveland mine, Randville, has awarded a contract for the construction of a concentration plant to produce around 700,000 tons per year.

Operations are planned to begin in the spring of 1959. About 200 men will be employed when the mine and plant are operating. F. H. Lee will be superintendent of the Groveland while E. W. Geist has been appointed general superintendent of district's open pit mines. Beneficiation plant planned for construction at Randville will cost $11-million.

Lake Superior & Ishpeming R. R. has plans for a new 1600 ft dock and additional rail line at Stonington, east of Escanaba, for loading pelletized ore. Plans involve an expenditure of about $10-million.

Cleveland-Cliffs Iron Co. is planning an expansion of pelletizing plants and mining facilities for their low grade ore operations at Republic and Humboldt.

MINNESOTA

Zontelli Brothers, Inc., Ironton, independent mining company, has merged with the Pittsburgh-Pacific Mining Co. of Hibbing. Operations on the Cuyuna range will be conducted under the name of Zontelli Brothers Division, Pittsburgh-Pacific Co. with the same personnel previously in management of Zontelli Brothers. Their West Airport mine at Crosby has largest estimated reserve of any of their nine properties: 864,950 tons as of May 1956. Graham mine at Hoyt Lakes, Minn. is second with 126,040 tons. Operations of the company on the Mesabi range will continue to be carried on under the name Pittsburgh-Pacific Co. The merger does not affect Zontelli Bros. operations in rural electrification, power construction and general contracting.

New heavy media addition to Oliver Iron Mining Division's Trout Lake plant—first iron ore washing plant on the Mesabi range, built in 1910—is progressing rapidly. It is expected to be completed and make its first test runs this year.

Iron ore beneficiation plant at the Mahoning mine of Pickands, Mather & Co., which produced its first concentrates in June, is prepared to handle almost any type of crude ore it is likely to encounter. It has crushing, washing, heavy media separation, cyclones and spiral units.

Godfrey underground mine, taken over from Oliver by Snyder Mining Co. in 1956, is operating normally and is also mining from its own adjoining South Tener mine with an estimated tonnage of about 1.8-million tons. Some ore was mined from the South Tener by Oliver between 1951 and 1955.

Snyder Mining Co. has discontinued drilling operations on the lands it optioned in 1956 near Butternut, Wis. in Ashland county.

St. Louis County mine inspector's report for 1956 shows that a total of 49,359,148 cu yd of stripping from 65 mines was

DRILL LARGE DIAMETER HOLES THE MODERN WAY... WITH

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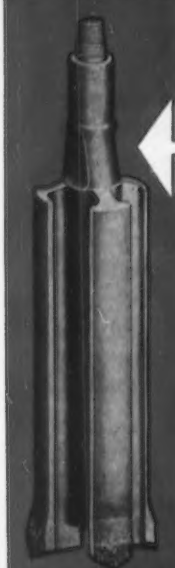

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Field performance has amply proved these bits to be the driller's answer to **large hole** problems. They are made special, to your specifications and design, in any diameter; size and weight limited only by the handling capacity of conventional drilling rigs. They can be furnished to run on drilling stem or with integral rope socket top.

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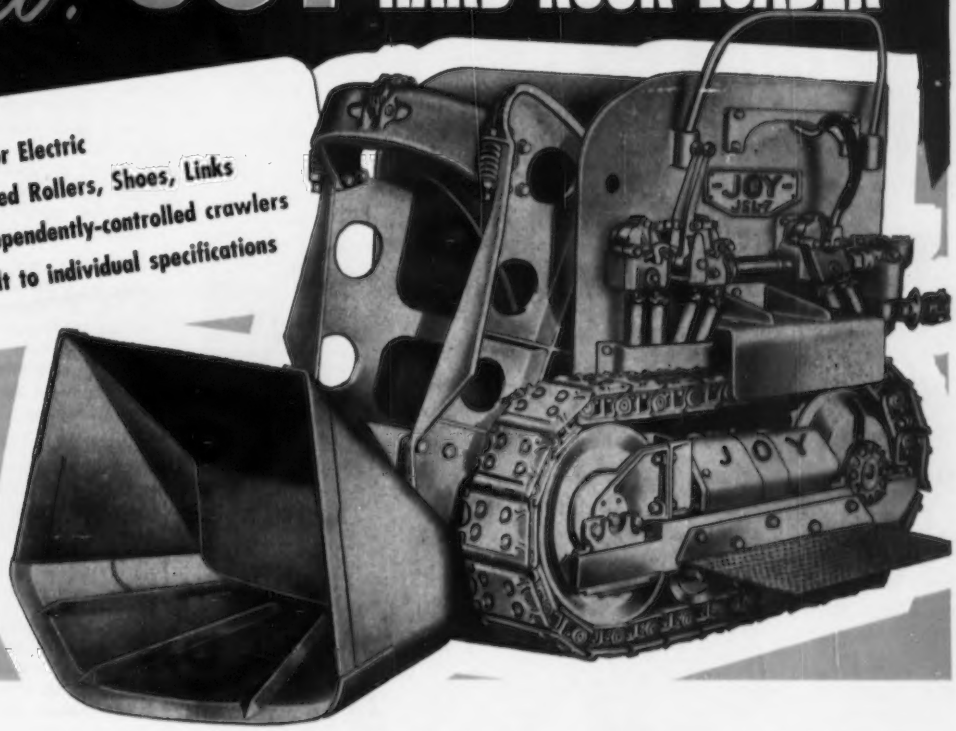

The all-new Joy JSL-7 Shovel Loader is designed and built specifically for the really rough hard rock jobs. This crawler-mounted brute has been beefed up with forged parts at all the tough impact points; has three interchangeable Pistonair® motors in the air version—(255 ft. lb. stall torque motors in the electric)—and delivers a 12,080 lb. crowding effort at the bucket lip.

Joy JSL-7 Loader	Specs
Height, minimum	60″
Headroom Range	79″ to114″
Width, overall	57½″
w/platform	68″
Length, bucket in digging position	112½″
Weight, Air	9,650 lbs.
Electric	11,250 lbs.
Loading, average	2—4 tpm

Independent Crawler Control

Each crawler, independently powered by a famous Joy 15 hp Pistonair motor, is reversible . . . the Joy JSL-7 can turn in its own length. No need for run-backs and repositioning when this Shovel Loader swings into action!

Control Positioning Optional

Standard positioning of controls on left side of Loader as pictured. Right-side mounted or dual mounted controls are also available in either air or electric models. "Deadman" controls flip to neutral when released.

Joy Builds to your Requirements

In addition to standard specifications tabulated at left, the Joy JSL-7 Shovel Loader is available with special buckets, arms and counter weights for mucking on grades greater than 9° uphill or 15° downhill. Arrangements for bucket discharge heights to 87″ are available.

Call in the Joy Engineer and tell him what you want the JSL-7 to do for you. Ask him about the choices of bucket design and capacity, grousers, 'dozer attachments and other available extra equipment. Write to *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada *Joy Manufacturing Company (Limited), Galt, Ontario.*

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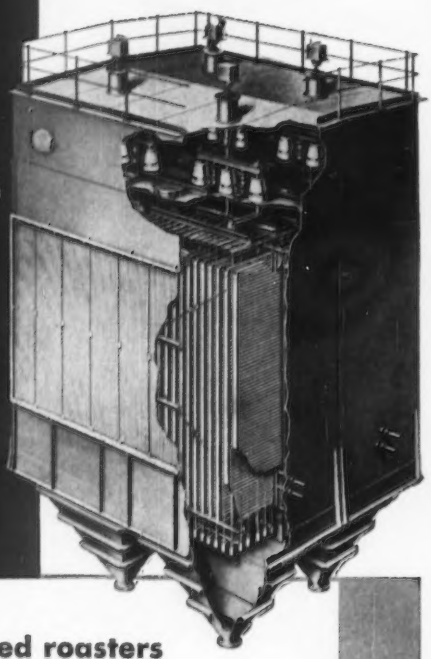

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Minnesota *(Continued)*

removed during the year. Largest single yardage was that of Erie Mining Co. with 7,671,933. M. A. Hanna Company's Morton mine was second with 3,022,438 cu yd. County's 81 mines employed 11,017 men with six fatal accidents, three of which occurred underground. Rouchleau group and the Sherman groups (both Oliver Iron Mining Division operations) each shipped over 5-million tons of ore. Taconite mines and plants reached a total of 2,061 employes during the year, or 18.7% of the total, a ratio that may be expected to increase in future years.

Long belt conveyor which carries stripping from the big dragline now operating at M. A. Hanna Co. Pierce group of mines in North Hibbing, (formerly the Norpac) is now in service. It moves the surface overburden more than three miles from mine to the dump between Hibbing and Chisholm.

United States Metals Refining Co. has let a contract to the Centennial Development Co. of Salt Lake City to sink a small shaft to a depth of 215 ft on lands north of Wakefield which they are currently exploring. The company controls 20,000 acres in the area and is operating ten diamond drills.

Minnesota State Executive Council and the Commissioner of Taxation have awarded prospecting permits to: Pacific Isle Mining Co., two permits (one of which covers part of the Atkins mine, near Kinney); Pittsburgh Pacific Mining Co., one permit; Coons Pacific Mining Co., one permit covering a 165,000 ton lean ore stockpile from the Mott mine, operated by Oliver Iron Mining Co. (1949-'51) with some stockpile shipments since that date by the Oliver and E. A. Young, Inc. U. S. Steel Corp. was awarded two permits in the taconite area near Erie Mining Co.'s operations.

As of the end of August, shipments of iron ore from the Lake Superior area were about 53.2-million tons, over 15.5-million tons ahead of that date in 1956.

MONTANA

A second iron mining operation is under way in the Belt Mountains. Project began last month when earth scraping was started over what is said to be "some of the richest iron ore in the world."

Located between Running Wolf Creek and Dry Wolf Creek (about 18 miles from Stanford), mine will be operated by the new Montana Iron Ore Co.

Heading the new company will be Dewey Whittaker, Seattle, who owns a number of mining claims in the Belt Mountains. His wife, Mrs. Gail H. Whittaker, is secretary; Lem G. Wingard, Seattle, vice president and treasurer, and Norman Peterson, Billings, superintendent of mining operations.

Whittaker said that the vein should run about eight to 70 ft in width and about 2,000 ft minimum in depth. He

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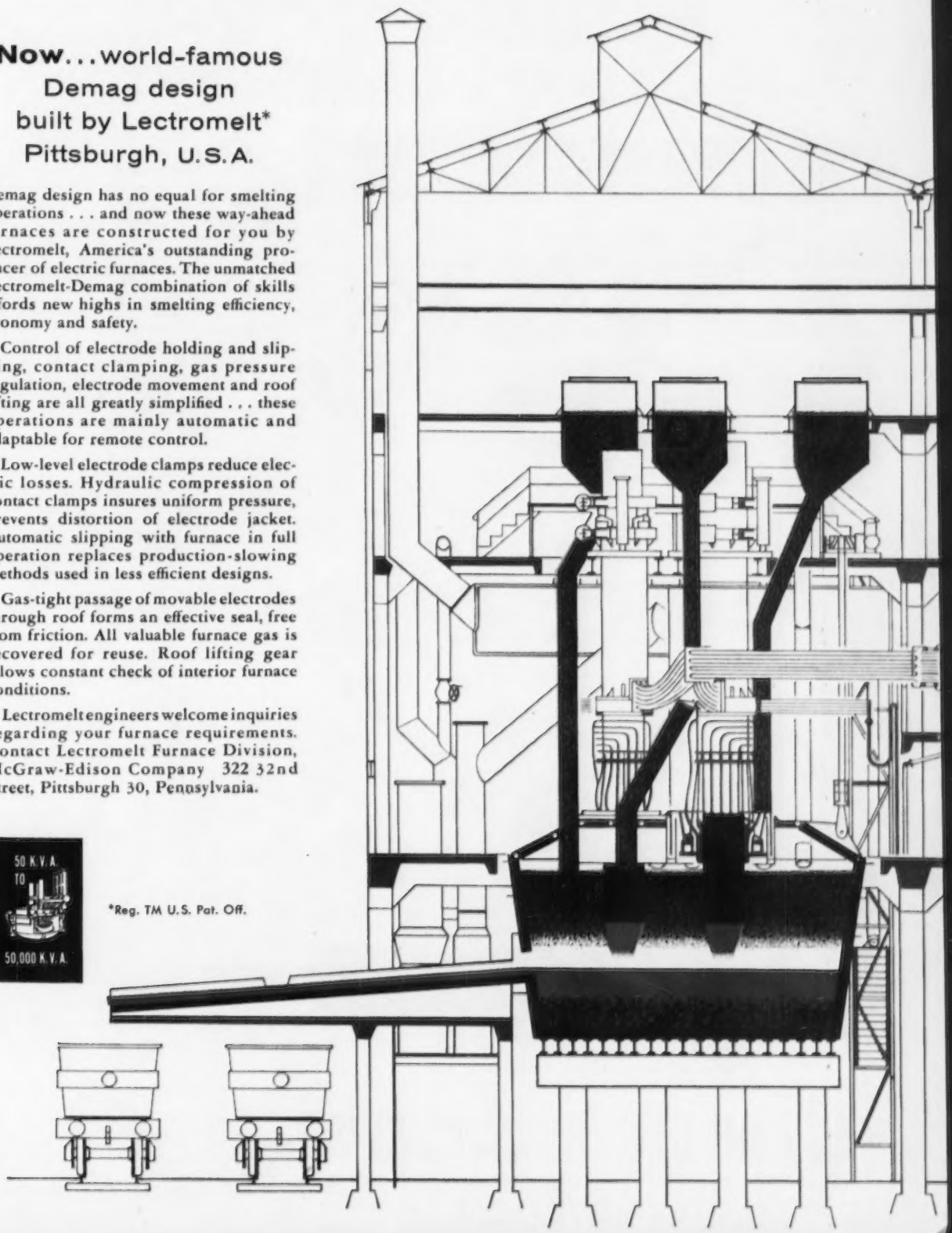

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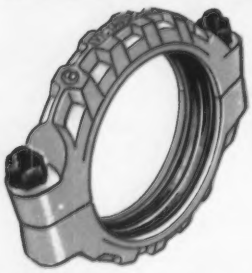

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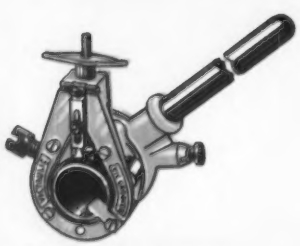

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Montana *(Continued)*

said, "This means that open pit operations could go on for a number of years before any underground work will have to be done. We hope to hit 500 tpd before winter sets in."

National Uranium Corp. of Wallace, Idaho, has completed installation of ore-sorting facilities at its Little Joe uranium prospect on the West Fork of the Bitterroot River in Ravalli County and is now drifting on the uranium-bearing phyllite vein structure which has been exposed on the surface for a distance of about 500 ft. The vein contains high-grade ore in the form of uraninite, uranophane and gummite, but the ore is spotty and drift muck must be sorted to obtain a shipping grade. A test sample of nearly 50 lb, sent to Vitro Uranium Corp. for amenability tests, averaged 3.5% uranium oxide.

Property is operated by National Uranium as a joint venture with Hypotheek Mining & Milling Co., also of Wallace.

Complete suspension of Minerals Engineering Co.'s tungsten mining operations in Beaverhead County (Dillon) has been ordered by president Blair Burwell, Grand Junction, Colo.

Burwell stated that the cessation of operations is due to the continued fall of tungsten prices resulting from the dumping of foreign tungsten in the U. S. market.

Minerals Engineering has been one of the largest employers and taxpayers in Beaverhead county for the past several years. It began operations in the county in 1951. Its payroll and expenditures in recent years have run from $1- to $1.5-million annually and its total tax bill currently is $175,000.00.

Burwell said that the company hopes to resume operations in the county when the condition is corrected. The shutdown will affect between 80 and 90 workers in Beaverhead County.

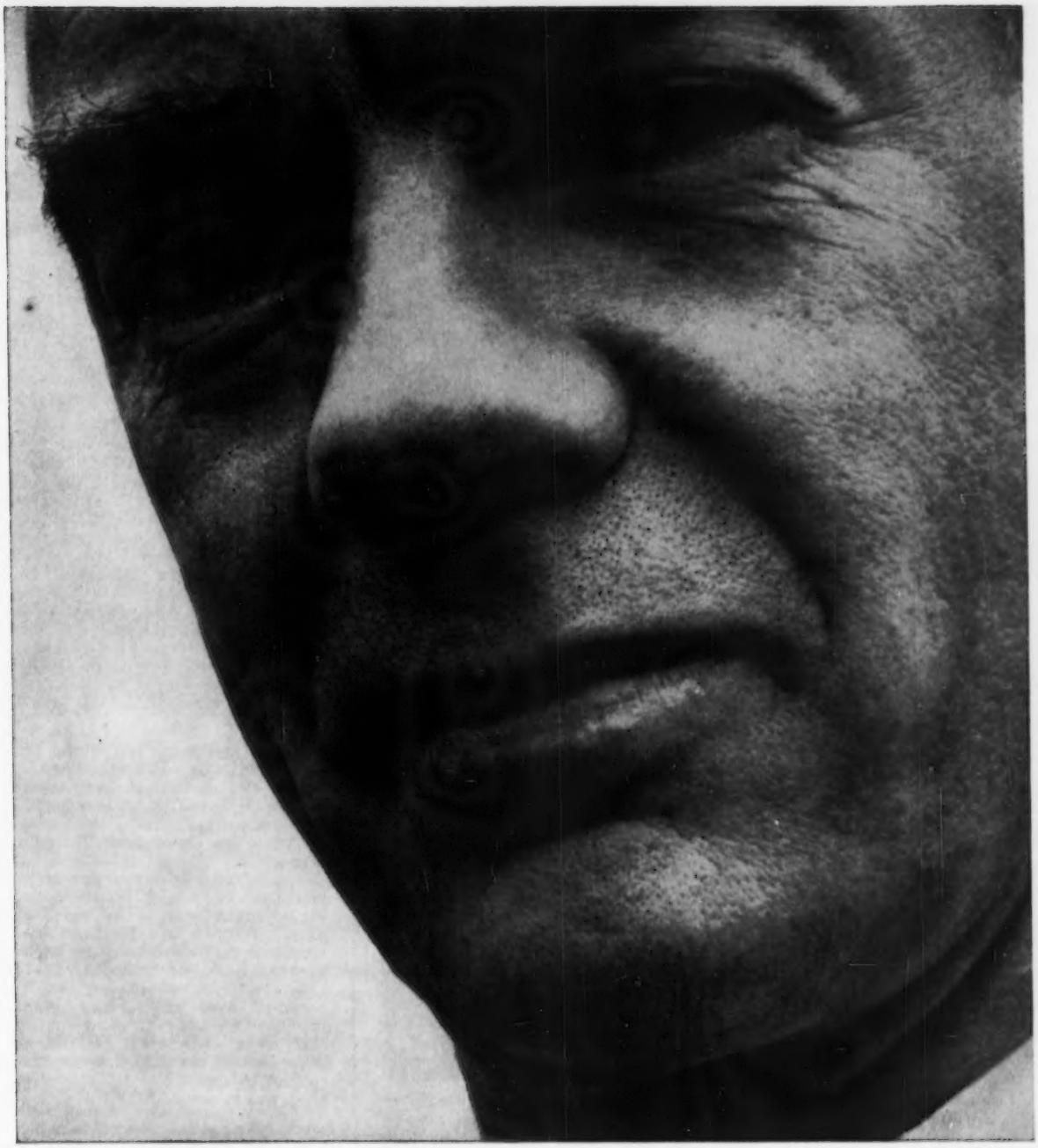
Unpatented mining claims in the Deer Lodge National Forest are being investigated by Thomas E. Schessler, Forest Service mineral examiner from Missoula; Blaine Tennis, Butte, and Gerhart Nelson, Deer Lodge.

It was indicated that use of forest resources is complicated because there are more than 2500 unpatented claims in the area. It was stated that there are certain drainage areas where there are so many unworked mining claims whose owners are unknown that it is impossible to cut timber.

NEVADA

Kaiser Aluminum & Chemical Corp. has closed its fluorspar mill near Fallon, and placed the facilities on a standby status for an indefinite period, company announced today.

Mill, erected in 1952, produced an acid grade of fluorspar concentrate from ore mined by the company near Gabbs. Mine was closed earlier this year by depletion of deposits at the location and



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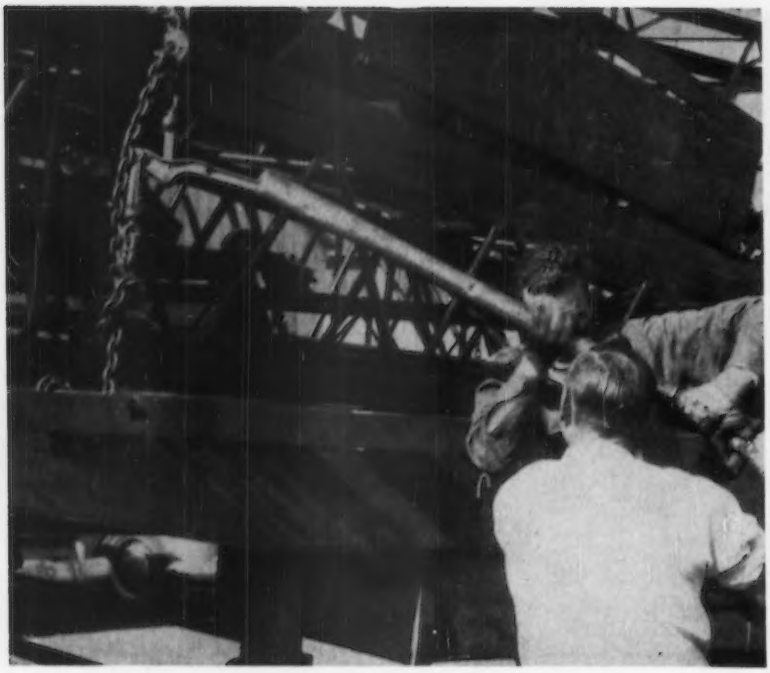

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Nevada *(Continued)*

mill had been operating on stockpiled ore.

Work force of 14 persons was employed at the mill and several of the employees are moving to Kaiser Aluminum plants in the Western States area.

Uranium, titanium and rare-earths reportedly have been uncovered near Tonopah. Assays show the uranium to run from 0.16% to 1.2% together with significant amounts of titanium, cerium, lanthanum and yttrium. Surface showings indicate the possibility of a large orebody.

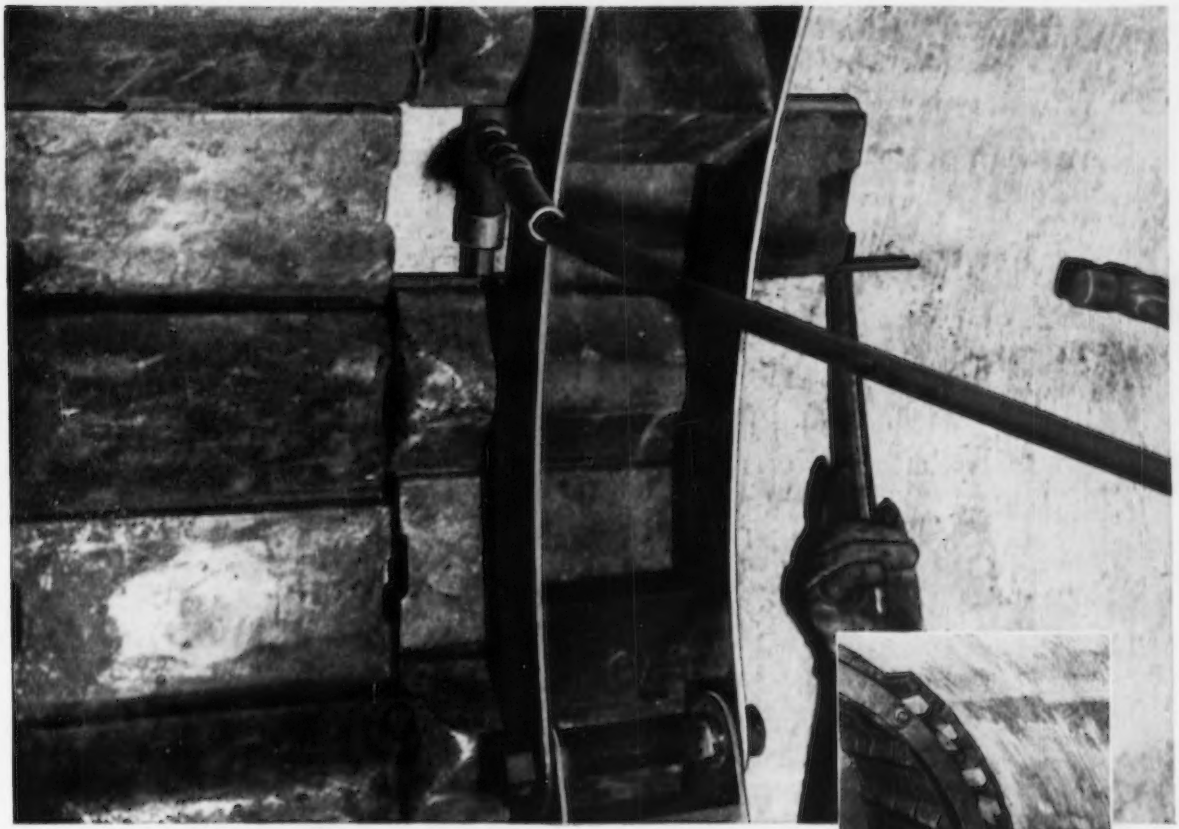
At present, the discoverer is running a tunnel in on the vein, and is also applying for a DMEA loan to finance the proposed drilling program. Negotiations are already under way for an upgrading plant to be installed at the claims.

Net proceeds of Nevada mines were down more than $14-million during the first six months of this year, as compared with the same period in 1956. Report was made by Robbins Cahill, secretary of the Nevada Tax Commission, who said that mines had reported net proceeds of $8,612,968 during the first half of 1957 as compared with $23,378,670 during the first half of 1956. He said most of the drop was in copper production. Anaconda Co., Kennecott Copper Corp., and Consolidated Copper mines produced $5.1-million in ore during the period this year as compared with $15,622,000 in the first half of 1956.

Flexiform Engineering and Mining Co., of San Francisco, and Eureka Hamburg Mining Co., of Oakland, have entered into an agreement for developing the long dormant properties of former Eureka Uncle Sam Consolidated Mining Co. near Eureka. Indicated ore reserves are valued at $20-million, according to explorations by mining engineers, and values include gold, silver and lead. Eureka Hamburg and Flexiform have taken over the properties from its former owner, Mrs. Seager, of Laguna Beach, Calif. Financial arrangements are reported to have been completed, and operations are scheduled to start in the near future. High grade ore will be shipped to Salt Lake City, and low grade ore will be upgraded at the site before being sent to smelter.

Mineral Venture Co., with offices in Salt Lake City, has completed an extensive trenching job at its property in the Austin area near Apex mine, and has now started a drilling campaign. Work is being done where important anomalies have been found by aerial prospecting. Rich deposits of uranium are being developed nearby by Apex Co., and Mineral Venture Co. holdings are on the same strike between Apex and the Wilson property. R. L. Holt, of Salt Lake City, president of Mineral Venture Co., has announced plans to develop the mine extensively.

Full scale operations are in progress at Consolidated Coppermines Tripp Pit at Kimberly in preparation for installation of a skip-hoist system. Extensive excava-



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With B&W Universal Liner Plates, direct labor cost and installation downtime are reduced. Small, lightweight castings are easily handled, minimizing worker fatigue and eliminating the necessity for cranes. Also, B&W Universal Liner Plates give longer life of greater usefulness. Uniform wear results from better quality control on a mass production casting with permanent molds. You save money on liner inventory, breakage claims and delays for replacements. Positive seating of small castings on mill shell means less breakage of castings under operating conditions. Costs are also reduced for storage space since small castings stack easily.

Liners are supplied in two nominal thicknesses, 1½″ and 3″ with 1½″ high lifters. Castings are 6″ wide x 12″ long. For additional information on B&W Universal Liner Plates, write The Babcock & Wilcox Company, Process Equipment Dept., Barberton, Ohio.

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Nevada *(Continued)*

tion is necessary before actual installation work begins, and big earth moving machinery is now at work on that phase of the project. Completion is scheduled for April 1, 1958. Headframe and hoist house will be situated on Tripp's northwest rim and tracks will extend downward into the pit on a 36 deg angle. Hoist's capacity will be 100 tons hourly, when completed, and each skip will have 25 ton capacity.

Apex Minerals Inc. is now developing and stockpiling uranium ore at five locations on its property west of Austin. High grade ore extending 11 ft was uncovered by Hole H which went down to the level of Adit No. 1, and a winze from same adit is now driving on the ore to determine its other dimensions. Tunnel from Veach canyon under the Diamond Claim has cut ore body at 100 ft, and another tunnel from the canyon has been started to cut in at a lower level. Apex is Nevada's largest producer of uranium.

White Caps Gold Mining Co. has virtually completed its big job of pumping water from the White Caps mine at Manhattan, and production is expected to start in the near future. All levels have been cleaned up, shaft has been repaired, and ladders have been put down to restore the property to working condition after 22 years of disuse. White Caps produced gold up to the 1930's, and then ceased operations. Recent work has uncovered antimony assaying in excess of 60%, and a 4-in. vein of cinnabar assaying more than 8% mercury.

E. C. Perkins, of Boulder City has been given special recognition by the Bureau of Mines for his new process for upgrading manganese ores. His method includes leaching for one hour, using caustic solution equivalent to 100 lb of caustic per ton of concentrate. Trials have showed that it upgrades manganese product through removal of silica.

NEW MEXICO

Rare Metals Corporation of America has developed sufficient ore reserves in the San Mateo area of Ambrosia Lake district for launching of a uranium mill program, according to M. H. Kline, vice president at Salt Lake City of the affiliate of El Paso Natural Gas Co.

Mr. Kline did not disclose proved tonnage nor has Rare Metals as yet submitted a mill proposal to AEC.

He said that the ore was 750 ft below the surface, that ground water was no serious problem. It would be mined by underground methods.

Phillips Petroleum Co. continues an aggressive campaign to develop uranium ore reserves in the Ambrosia Lake District of McKinley County.

Company has agreed to conduct 50,000 ft of exploratory drilling on properties of three Salt Lake firms in Section 16, Township 14 North and Range 10 West.

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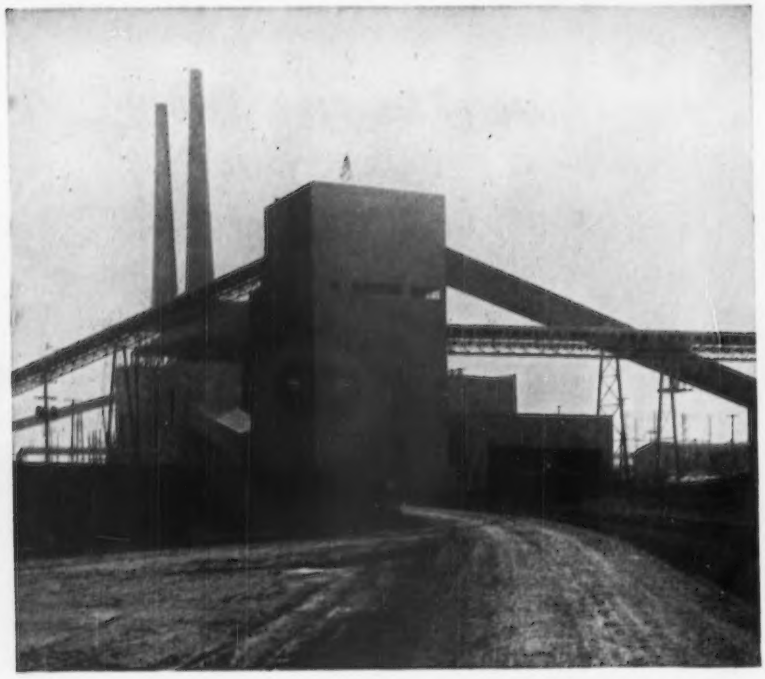

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New Mexico *(Continued)*

In return, Phillips would earn a 50% working interest in any orebody discovered.

Participating are: Mount Peale Uranium Corp., 16⅜% interest, plus 4¼% royalty; Aneth Corp., 8⅛% interest and ¾ of 1% royalty; Coronado Exploration Corp., 25% interest.

NORTH CAROLINA

East Coast Minerals Corp. of Jacksonville, N. C., has obtained a certificate of incorporation from the North Carolina secretary of state. Firm has authorized capital stock of $100,000 and incorporators are W. V. Venters of Richlands, N. C., and George Merritt and Oscar Schneider, both of Swansboro.

Sizable deposits of phosphatic sands have been found in Beaufort County as a result of a study made for the North Carolina State Department of Conservation and Development, it was revealed Aug. 13.

Dr. J. L. Stuckey, state geologist and head of the C&D Dept.'s mineral resources division, said the study had found the BPL content of the Beaufort sand to range from 9.8 to 31%.

C&D Dept. became interested in the study earlier this summer when the Bear Creek Mining Co., subsidiary of Kennecott Copper, leased mining rights for 60,000 acres of area's submerged lands, and announced that it would build a $25-billion plant if phosphate deposits justified the cost.

Also interested in exploring the area for phosphate deposits are General Crude Oil Co. (subsidiary of Sun Oil of Penn), International Mineral and Chemical Corp., Chicago, and Monsanto Chemical Co., St. Louis.

UTAH

"Most significant exploration" in recent months by Vanadium Corporation of America at its Marysvale, Piute County, uranium property was opening of Bullion Monarch No. 4 vein, it is reported.

Statement to shareholders of Bullion Monarch Uranium Co. by geologist F. W. Christiansen, says this work by VCA, which leases Bullion holdings in the district, has opened up considerable indicated ore on the surface and greatly enhances the reserves on the Farmer John No. 4 claim.

VCA had not, however, commenced lateral underground connection or surface sinking on the new discovery at date of the report.

Railroad haulage tunnel (1600 ft) which is being driven from the Big Buck mine of Standard Uranium Corp. to the Col-U-Mex joint property in Big Indian District is 80% complete and will accommodate production of 500 tpd ore.

According to T. D. Harrington, Albuquerque, N. M., Col-U-Mex president, ore drilled out to date in exploratory

hole indicates existence of a "multi-million dollar property" in the joint venture.

Averages of DMEA drilling run 0.81 to 0.90% in nine foot sections of ore. One section a foot in width averages 4.62% U_3O_8 in chemical and radiometric assays.

Vitro Uranium Co., a division of Vitro Corp. of America, has signed long-term agreement with Jen, Inc., of Moab, for the purchase of large quantities of low-lime uranium ore, according to recent announcements.

Under agreement terms, Jen will ship uranium ores from four claims in Big Indian Mining District of San Juan County, to Vitro Uranium's Salt Lake City mill.

Cord mine, which includes the Pasco, Uncle Ben, Jen and Jackie uranium claims, was purchased by Jen in March from E. L. Cord and Associates, Reno.

Agreement extends to March 31, 1962, the expiration date of AEC purchase contracts. Jen will provide a maximum 10,000 tons of ore per month during the life of the agreement and can increase shipments to 12,000 tons per month on 30-days notice. Value of the ore concerned could amount to $38-million if the maximum amounts of ore are shipped.

White Canyon Mining Co., in which Texas-Zinc Minerals Co., now holds controlling interests, speeded development and expanded ore reserves in the White Canyon and Red Canyon areas of San Juan County.

A. L. Hayes, Grand Junction, Colo., president, said that a total of 3,477 ft of development footage was driven from Nov. 1, 1956 to May 1, 1957. These developments in four uranium ore channels have proved "continuous orebodies of commercial size and grade," he said in interim report to shareholders.

A vertical shaft was completed at the Hideout No. 1 mine 2,000 ft from portal of this property.

No reserves of ore were detailed in the report. The company is now shipping via new short-cut road near the Goose Necks of San Juan River to the Texas-Zinc mill, nearing completion at Mexican Hat in the same county.

A core drilling program with three rigs in the mining areas has been underway for many months.

Prior to commencement of buying at the mill, White Canyon was shipping ore at rate of 1,000 tons monthly to AEC's temporary station in the district. That station has since been closed.

Royal Corp., formerly Royal Uranium Corp., has acquired 12 additional claims in the Indian Creek district of San Juan County, and plans an engineering and geological survey of the properties where its principal mine is located.

Royal has also acquired 12 uranium claims near Rock Springs, Wyo.

A geophysical and geochemical prospecting program will be undertaken by New Park Mining Co. this fall on claims of Silver Standard Mining Co. and National Treasure Mining Co. in the Ophir district

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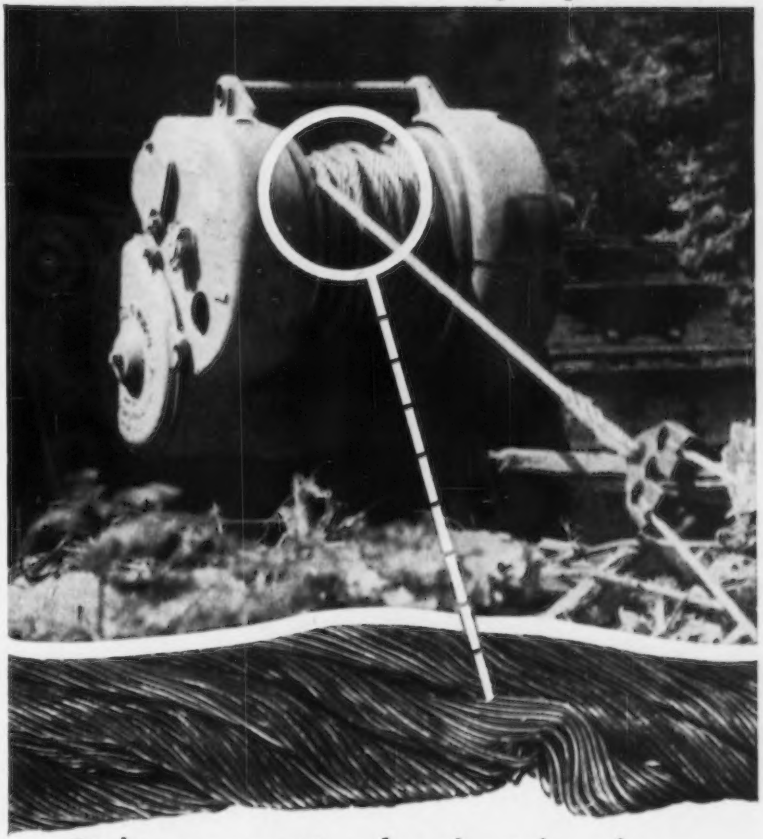

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Utah *(Continued)*

of Tooele County, once a renowned gold-silver producing area.

Clark L. Wilson, Salt Lake City, vice president and general manager of NP, said that the probe will be along the Lakes of Killarney fault.

WASHINGTON

Goldfield Consolidated has begun a 2,000-ft diamond drilling project at the Anderson mine near Northport. Cy Higginbotham, Goldfield manager, said the project would take about two months. The Goldfield mill at Aladdin was closed earlier this year because of lower prices for lead and zinc. The present exploration project may be an indication that work will be resumed if metal prices improve.

Daybreak Uranium, Inc., was slated to begin shipping uranium ore in stockpile on Mount Spokane and Spokane Indian reservation mining areas to the new Dawn Mining Co. processing mill at Ford on Sept. 16.

Kae Sowers, secretary treasurer, said that contract negotiations have been completed except for confirmation of distances of ore supply from the mill. Sowers said that all three of Daybreak's producing leases were within 50 miles of the new mill.

Mill went into operation in August and has been processing ore from Dawn's Midnite mine on the Spokane Indian reservation.

WYOMING

Mineral rights on school land grants in Wyoming crossed by Union Pacific railroad belong to the state, the Wyoming attorney general's office has ruled.

Asst. Atty. Gen. Arthur F. Fisher based his opinion on a recent U. S. Supreme Court decision holding that the Federal Government retained the mineral rights when right-of-way was granted to the railroad across public lands.

When Wyoming was admitted to the union, sections 16 and 36 of each township were given to the state as school grants.

Fisher said in cases where railroad right-of-way crosses either section 16 or 36 or another section which is a school land grant, the state retains mineral rights.

State Land Commissioner Ben Cossman estimated that 25 to 30 sections of land in southern Wyoming would be affected by the ruling.

IN CANADA

BRITISH COLUMBIA

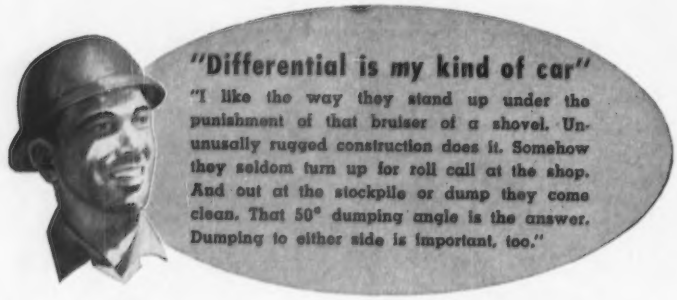
British Columbia's mining industry, alarmed when amendments to the Mineral Act were first announced by the provincial government, were given a chance to see how the amended Act will function.

Mines Minister Kenneth Kiernan said nearly all the suggestions of the industry regarding Act administration had been adopted by the government. L. T. Postle, president of Mining Association of B. C., said, after having read the minister's statement, that it "does appear to embody most of our suggestions" and appeared "workable." However, he expressed hope that the Act could be simplified at the next session of the Legislature.

Under previous tenure laws, claims could be turned into perpetual Crown grants after $500 had been spent on them. The new system provides for holding of claims for five years (providing $500 work is done on them), issuance of five-year retention leases, and then, unless retention leases are renewed, issuance of renewable 21-year production leases.

Retention lease would be issued provided the application is accompanied by an affidavit of the applicant that, in his opinion, the claims cannot be profitably put into production at that time.

When application for renewal of a five-year retention lease is made, the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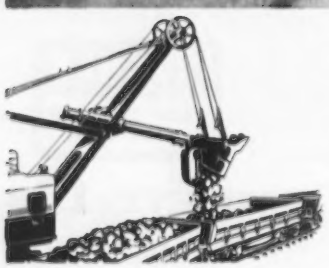

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Mammoth pit operation at Antikokan will be supplemented by $2-million concentrator

Steep Rock Goes After High Grade in Waste

SCHEDULED for operation next season, Steep Rock Iron Mines Ltd.'s new concentrator will handle some 750,000 tons of crude material from the waste piles near the mine during the shipping season.

Waste, much of it from the flanks of the high grade deposits which supply Steep Rock's direct shipping ores, will be processed in the $2-million installation. Company tests of the waste piles proved the economy of the operation. Material will be gravity separated.

AMC Salt Lake

(*Continued from p 93*)

rpm. Slopes vary from 16 to 18 deg. Total cost per foot constructed is reported at $128.00 and cost per belt-hp at $540.00. Total operating cost for the 3,500-ft conveyor system is $0.0407 per ton.

During Earl F. Hanson's discussion of the relative economy of 6-, 8- and 10-yd shovels it has pointed out that the size of earth-moving equipment for strip mining is generally determined by the following considerations: (1) total number of cubic yards of material to be moved and production rate; (2) operational mobility; and (3) transportation equipment. Available experience of Utah Construction Co. on various open pit operations with the three sizes of shovels discussed has shown that the 6,-8- and 10-yd shovels can do almost anything the smaller shovel can do, and do it better and at a lower unit cost. In hard digging, the large units have a distinct advantage. Aside from daily output there is only a small difference in unit cost between three shovels working under similar conditions.

During the underground drilling symposium, E. B. (Ted) Olds, assistant mine superintendent, Bunker Hill Co., suggested that a questionnaire be sent to operators with a view of obtaining information useful to operators and drill manufacturers. He also stated that operators believe 60,000 to 70,000 ft of drilling to be the economical life of a rock drill. R. L. Sandvig, research engineer, of Thor, feels that applications of the conventional percussion drill have by no means been exhausted. As the TC bit quality continues to improve, operations research at the mine and application research at the factory still have the foremost task of improving the underground drilling machine. J. W. Clemens discussed in detail the use, testing and performance of bit of various designs. He listed thread strippage, bit breakage (skirt or wings), and loss of bit because of rod failure as common causes of bit failure. R. H. Holsing, assistant chief engineer, Timken Roller Bearing Co., in regard to the TC bit pointed out that after years of research carbide failures have been advanced to where they equal or exceed the life of the bit body. Others taking part in bit, drill steel and rock drill problems included M. W. Hawkesworth, general sales manager, Western Rock Bit Mfg. Co.; Floyd R. Anderson, chief metallurgist, Gardner-Denver Co.; and J. E. Feucht, manager, engineering department, Le Roi div., Westinghouse Air Brake Co.

Practices and equipment currently employed for drilling taconite at the Pilotac property of Oliver Mining Co., Mountain Iron, Minn. were presented by Irving H. Rubow, superintendent. Drilling units actually in use are churn drills, rotary drills and jet piercing units. Downhole drills are being tested for possible combined rotary-downhole drill work. Average footage obtained per shift with redesigned churn drill bits and drills with 40-in. stroke is 30 ft; for rotary units 10 to 30 fph; and 33 fph for jets. Installation of mechanical feed system on jets (yo-yo) has increased footage per hour some 10%.

Dort Tikker, Monsanto Chemical Co., and L. E. Snow, general foreman, Utah Copper Div., Kennecott Copper Corp., gave informal and extemporaneous talks on ammonia nitrate blasting. Mr. Tikker pointed out that this explosive can be powerful and versatile if properly handled and cited a reduction of powder cost from 16 to 2.4c per yd at one property. Mr. Snow reported that dry "down holes" on higher bank sections of Utah Pit are now blasted exclusively with CGAN soaked with fuel oil and Primacord. Testing is underway to use this explosive in the regular "toe holes" drilled from prepared drill grades and sloped so as to bottom about 5 ft below the bench level. Loading is done with modified powder-blowing machine. Results of experiment to date indicate that substitution of CGAN powder for the gelamite and hercomite powders can be made on a pound-per-pound basis, resulting in a powder factor of about 10 tons of material broken per pound of powder used.

B. C. *(Continued)*

government may require a written certificate from a mining engineer that the minerals cannot profitably be put into production. Unless specifically requested, however, certificate is not required.

How to Install Bethlehem Roof Bolts

Illustrated here are four simple steps to take when installing Bethlehem Square-Head Roof Bolts. Regardless of the length and diameter of the bolts used, this procedure enables the job to proceed at a steady pace, and helps materially in minimizing installation costs.

Bethlehem Square-Head Roof Bolts are made in 5/8-in., 3/4-in., and 7/8-in. diameters, and are furnished in a wide range of lengths. We also manufacture a 1-in. slotted roof bolt, for use where a heavier bolt is required.

We recently issued an interesting 20-page illustrated catalog on roof bolting. If you would like to have a copy for reference, all you need do is drop a line to the nearest Bethlehem sales office.

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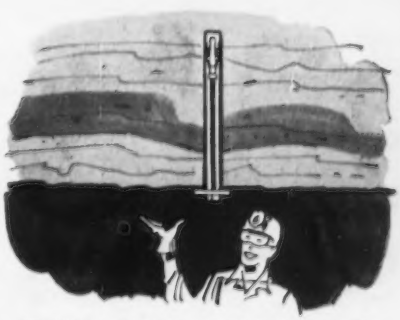
BETHLEHEM STEEL

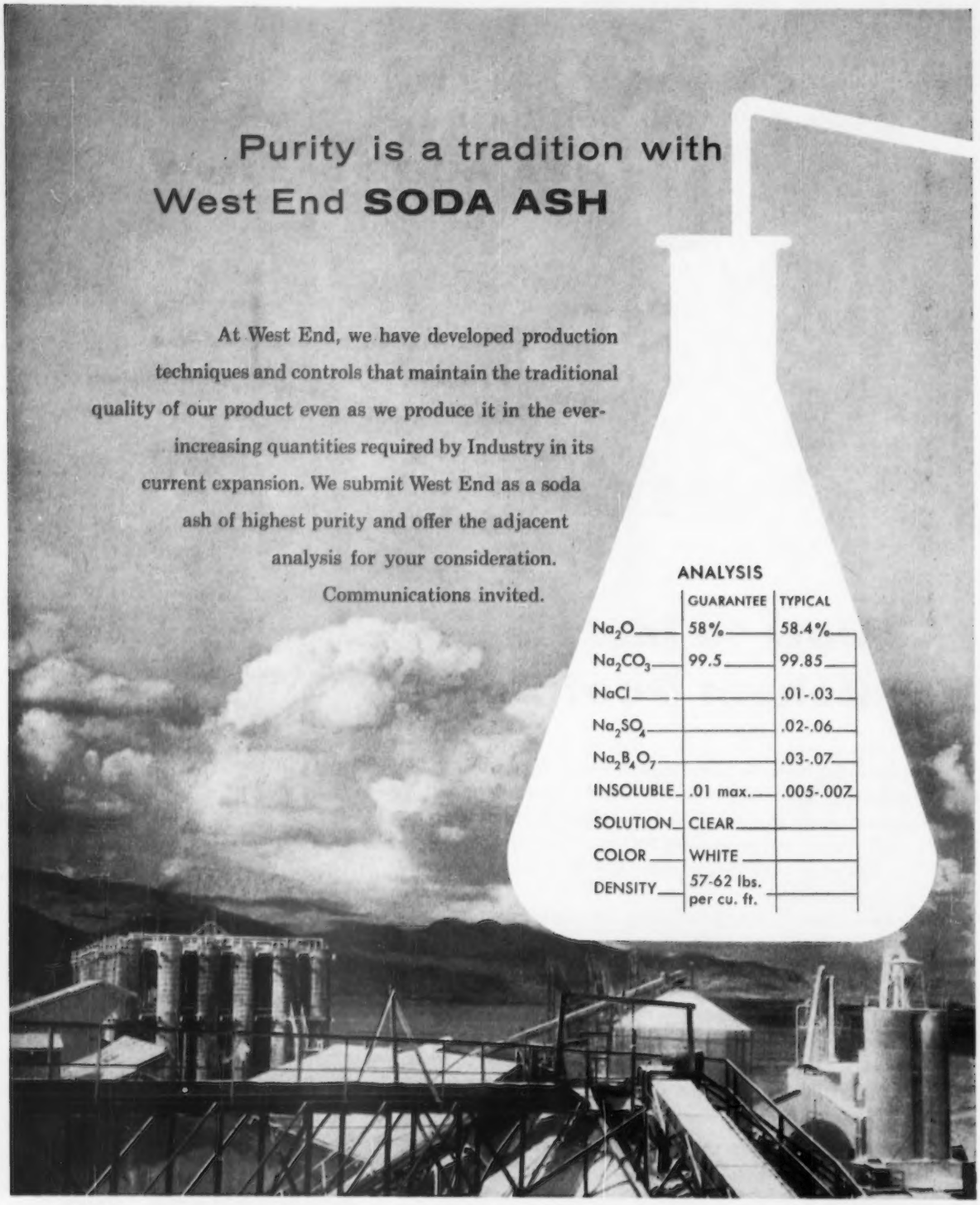
1 Using regular drilling equipment, the hole is drilled to required depth.

2 The assembly, consisting of roof bolt, square roof plate, malleable-iron shell and steel plug, is inserted in the drilled hole.

3 Bolt head is tightened with power wrench. This draws down the plug, expanding serrated leaves of shell.



4 The shell is anchored securely. Square roof plate furnishes additional support. Steel ties, connecting a series of holes, may be substituted.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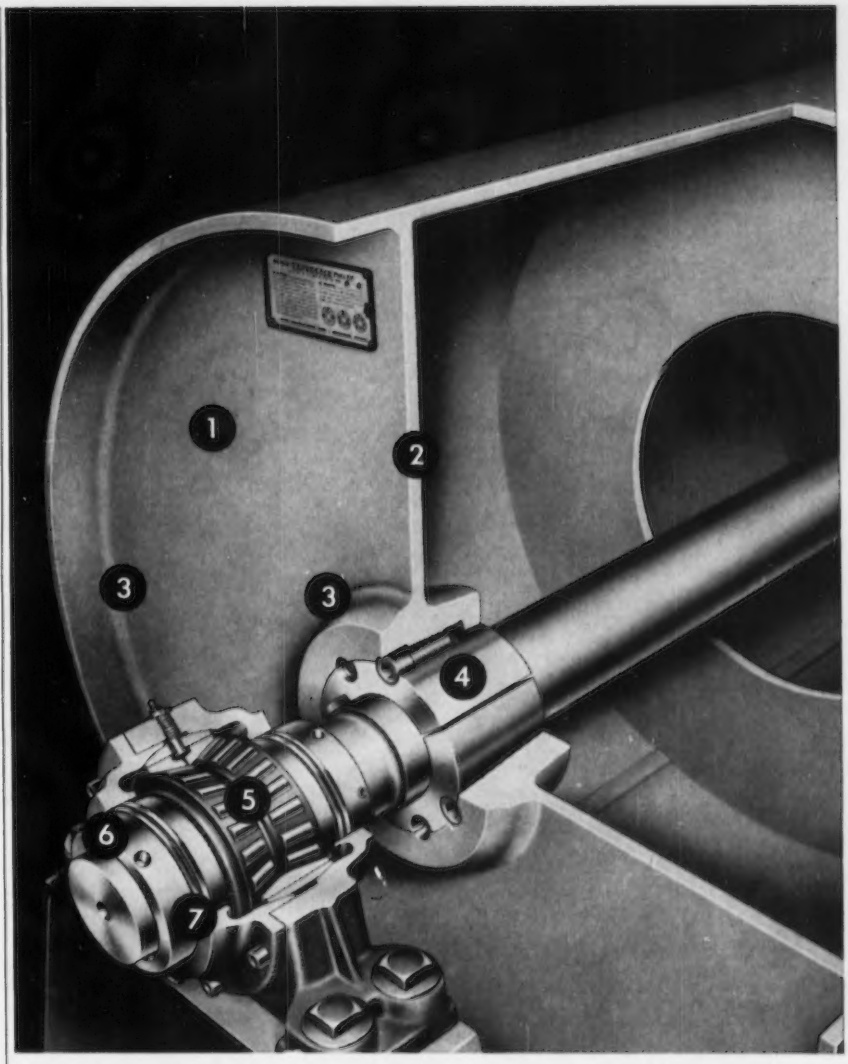

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B. C. *(Continued)*

Mr. Kiernan assured the industry that the legislation would be flexible, and that no practical mining operation would be confronted with unworkable conditions and requirements.

Craigmont Mines Ltd. property in Highland Valley is being examined by E.P. Chapman Jr., Albuquerque consulting engineer (an authority on porphyry copper) who will indicate the scope of the drilling program. Diamond drilling so far has resulted in assays about 1.8%.

Bralorne Mines reports an increase in grade of ore milled raised gold output by 40% despite the lower tonnage milled in the first half of this year. Some 34,262 tons were milled for gold recovery of 22,586 oz gold in the June quarter, raising the six month figure to 71,981 tons and 73,769 oz gold.

Belair Mining Corp. Ltd. is planning underground development of its 32-claim Bridon group to be known as the Belchrome mine, near Rock Creek in south central B.C.

Favorable ore deposition fully warrants development to the point of production, according to the geologist's report.

Empire Development is preparing to ship iron ore to Japan from Vancouver Island's Quatsino area. Mill is almost completed and about 300 men are at work on the project.

Empire, which has a contract to export 1,380,000 tons of ore over a three year period to Japan, is 40% owned by Quatsino Copper-Gold; 60% by Mannix.

Rexspar Uranium and Metals Mining Co. Ltd., having obtained successful diamond drilling results, reports that it expects to fill its Eldorado contract entirely from an open-pit operation.

Rexspar has a contract with the government-owned Eldorado Mining & Refining Ltd. for $21,553,812 of uranium oxide to be delivered by March 31, 1963. Eldorado has an option to take a further quantity deliverable up to Dec. 31, 1966.

Ore reserves at the property have been increased by 408,409 tons since May and now total 1,718,929 tons which the company estimates at 113% of the indicated ore required to meet specifications of the Eldorado contract.

Trojan Consolidated Mines Ltd. crushing and sampling plant now is in operation at its copper property in Highland Valley.

Pioneer Gold Mines of B.C. reports a net profit before exploration of $107,553 for the quarter ended June 30, a slight increase over earnings for the same period a year ago of $101,901.

During the quarter, an estimated $536,658 worth of gold and silver was produced. Total cost of production is estimated at $394,197, while depreciation and depletion is estimated at $43,474.

Pioneer produced 15,980 oz in the quarter ended June 30, compared to 15,085 oz in the same quarter last year.

Torbit Silver Mines has a prospecting party working in northern B.C., according to the company president J.A.H. Patterson.

Surface exploration work is continuing at both the company's owned and optioned properties in the area.

Triumph Mining Co. Ltd. has outlined a block of silver, lead-zinc ore at its Hercules property and diamond drilling now is in progress.

So far eight holes have been drilled, six of which show ore.

Western Exploration Ltd. is arranging to drive a tunnel 1,500 ft to a known orebody on the Mammoth property at Silverton.

Wolf Basin Mine is a new property under development by the owner, L. de Kock of Nelson. Assays show 23% lead and 8 oz silver and .60 oz gold.

Four distinct veins are all mineralized, with lengths exceeding 1,500 ft each.

NORTHWEST TERRITORIES

Glacier Mining Ltd. reports geological reconnaissance work now is under way in a 2,063,340-acre area in the Peel

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20 hours a day, 6 days a week, this truck hauls giant loads of coal over West Virginia and Pennsylvania roads covered with slag and stony shale. It's tire-killing work, yet these B.F.Goodrich Universals have been retreaded *three times* and are still going strong.

Full traction up steep grades

Trucks like this one carry anthracite—coal loads as heavy as 30 tons, up steep roads strewn with razor-sharp rock. But B.F.Goodrich Universal tires give positive traction, and more than 3,500 hours of service before retreading!

Miners get more retreads, better traction, bigger savings with B.F.Goodrich tires!

50% saving The wheels of this truck roll over some of the roughest terrain in the Pennsylvania anthracite region. But their B.F.Goodrich Universal tires stand up so well, they can be retreaded to give an additional 75% of new tire performance. No wonder the operator saves as much as 50% with B.F.Goodrich tires.

REPEATED experiences of miners—like the three shown here—prove that B.F.Goodrich FLEX-RITE NYLON Universal tires give more retreads, superior traction and bigger savings. Reason: the combination of the Universal tread design and the B.F.Goodrich FLEX-RITE NYLON cord body.

Husky, wedge-shaped cleats grip the ground for positive traction. The B.F.Goodrich FLEX-RITE NYLON cord body is stronger than ordinary cord materials, withstands double the impact and resists heat blowouts and flex breaks. Result: the B.F.Goodrich cord body outwears even the extra-thick tread, can be retreaded over and over.

Your B.F.Goodrich dealer has a tire for every kind of mining work. See him today or write: *B.F.Goodrich Tire Company, A Division of The B.F.Goodrich Company, Akron 18, O.*

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For higher work capacity on any given load, and for greater all-round daily production, more and more contractors are specifying torque converter drives in their new excavators, erecting cranes and loaders. And here are five good, profitable reasons why the torque converter is the preferred type of drive:

1. The torque converter eliminates lugging and stalling . . . permits engines to work at maximum efficiency delivering constant high-horsepower output for heavy digging loads and fast swinging.

2. *Smooth* converter power reduces peak loads throughout the machine's drive train because fluid within the converter absorbs much of the impact energy caused by quick drum speed change . . . thus protecting *both* driving and driven equipment.

3. When necessary, the torque converter smoothly delivers approximately twice normal torque to the drum, which, at slow digging speeds, represents an important advantage in power delivered to the dipper.

4. Cable life is extended since no sharp impact loads ever reach cables through the torque converter . . . constant line tension is maintained . . . there's no jerking or snapping.

5. An infinite variety of ratios is available to work with . . . permitting smooth, accurate, *safe control* of loads and delicate "inching" and "holding" under power . . . as well as adjusting for wide variations in dipper loading, substituting greater digging effort for speed, when required.

Wherever earth and rock are moved, wherever steel is erected, you'll find contractors using these five advantages . . . *to convert their horsepower into greater-than-ever profits!*

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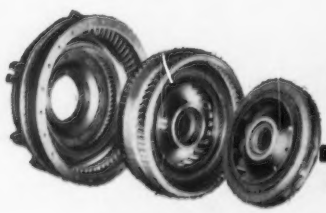
Twin Disc Torque Converters—*three-stage* or *single-stage*, from 30 to 1000 hp—are available from all leading manufacturers of heavy-duty machines. Be sure to specify one in your next unit. Take advantage of the five reasons why torque converter equipped machines do *more* work at *lower* operating cost.

Twin Disc is the world's leading manufacturer of friction clutches and fluid couplings for heavy-duty industrial applications . . . and the only manufacturer producing *both* three-stage *and* single-stage torque converters. Because of its complete line of industrial drives, Twin Disc can offer *unbiased* recommendations for any heavy-duty power transmission application.



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This cable is exposed to about as rugged a set of conditions as any cable is likely to meet. It has been pulled over sharp rocks . . . dropped over a 60 ft. cliff . . . and lies unprotected under sun and harsh weather day after day. Yet it has given unfailing service.

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Drilling goes faster—and at less cost—with air legs and 1¼ or 1⅜-in. carbide Rok-Bits, on ⅞-in. hex Brunner & Lay steel. You get cleaner holes. Holes that need not be blown before loading, thanks to wider chip channels. Rok-Bits work on new, uncut face; not in their own cuttings. Round, easy-to-load holes. Rods pull easily. Rod first-cost is lower. Rod life longer. Small, or LARGE, hole drilling—we have the bits for them all.

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Brunner & Lay carbide Rok-Bits in these body types—cross, chisel, "X", cutaway, taper-socket. Furnished in standard wagon drill and hand held drill threads, also —600, 400, 200 and 1-7 50 threads. Bit sizes up to 6½-in. in our Hole-Master. Write for new, FREE catalog No. 756.

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N.W.T. *(Continued)*

Plateau-MacKenzie River district, Northwest Territories. Four parties are in the field and a program of additional work is being prepared.

Alscope Exploration Ltd.'s president, Nicholas Martini, at recent annual meeting **said that reserves of 10-million tons of 1.5% lithium oxide have been indicated** by drilling of company properties at Reed Lake near Yellowknife.

Martini also reported an agreement with Beaverlodge Research Syndicate of Toronto to explore and develop 17 Alscope uranium claims in the Lake Athabasca area.

Drilling operations on the company's Morning-Midnight base metal property near Helena, Mont., was said to have uncovered a large orebody containing lead, zinc and silver with combined values averaging from $50 to $90 per ton.

At the meeting, Martini was re-elected president, H. McKay Twombly, was elected vice-president and J. L. Wilson, secretary and managing director.

ONTARIO

Pronto Uranium Mines Ltd. has issued the following statement:

The program which was started last December to increase milling capacity from 1250 tons a day to 1500 tons a day was completed in April. May was the first month when production averaged 1500 tpd. Ore milled during the quarter ended June 30 totalled 127,630 tons, producing a gross revenue of $2,814,497. Mine operating costs averaged $11.54 per ton while interest payments, Ontario Mining Tax and Head Office administration, etc. accounted for an extra $1.09 per ton during the quarter. By July average mill feed was running at 2.39 lb per ton with tails of 0.24 lb per ton. Net profit for the quarter after depreciation and preproduction write-offs was $705,806.

QUEBEC

The sixth hydroelectric installation at Aluminium Ltd.'s Saguenay complex is under construction at Chute-des-Passes, on the Peribonka River. Five 200,000 hp generators will provide more than 4.7-million hp to the complex, which includes smelters at Isle Maligne, Shawinigan Falls, Beauharnois and Arvida.

Perini Construction Co., with co-contractors, began work on the project in November 1956 with three adits along the main tunnel, which will run from a storage lake to the powerhouse six miles downstream on the Peribonka.

Completion target for powerhouse and tunnel is August 1959. The 6-mile tunnel will carry water at 18,000 fps down a gradual decline to a point where it will drop 636 ft vertically to the powerhouse.

SASKATCHEWAN

A good start has been made on the $20-million potash mining plant now under construction near Esterhazy, by International Minerals and Chemical

O-B
SHELLS AND PLUGS

. . . They've shortened the cycle with

O-B Expansion Shells and Plugs!

Bolting crews spend less time installing and wrenching bolts — have more time for drilling holes — when they use O-B expansion Shells and Plugs!

That's because O-B Shells and Plugs "go up easy and stay put" in any kind of top material. Bolt assemblies "go up easy" because the O-B shell flexes to overcome variations in hole diameter. They "stay put" even before wrenching because the weight of the assembly alone is enough to start expansion of the shell, and because the shell makes a firm contact with the sides of the hole.

This speedy installation leaves more time for drilling — means faster bolting, less exposure to unsupported roof, and an added measure of safety for bolting crew and all production workers.

Next time, order O-B Shells and Plugs!

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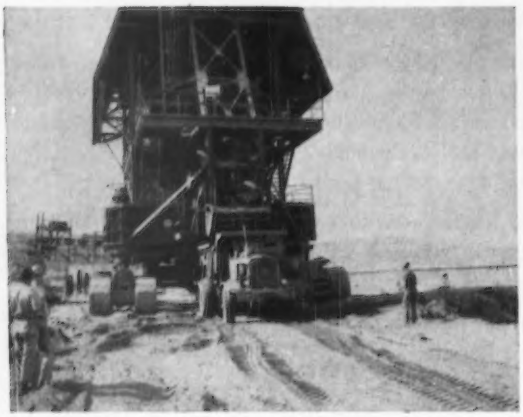
SIMPLICITY

screening methods for mines

INFORMATION ON ORE PROCESSING EQUIPMENT

SCALPING IRON ORE WITH A PORTABLE STRIPPING PLANT IN MINNESOTA



In order to move from one area to another in the vast Minnesota Iron Range, this stripping unit has been mounted on crawlers and motorized. It's fed by a 25 cubic yard drag line, and an average of 2500 cubic yards of material passes through the 5" openings in the grizzly deck every hour, with some 250 cubic yards being scalped off. Heart of the operation is a Simplicity 7' x 12' Heavy Duty Scalper. This unit is one of many such powerful machines we have built for mining. The first were built on request for an engineering company that needed a higher scalping output than their standard stationary grizzlies could give them . . . since then, we have developed many models, and installed them in numerous mines where fast scalping or scalping plus feeding were required. If your operation involves the scalping of large heavy lumps from fines, write us for further information on Simplicity Scalpers.

VIBRATING PAN TYPE FEEDERS CONTROL FLOW OF ORE FROM BINS

The controlled feeding of ore from storage bins is a problem that finds a very apt solution in Simplicity vibrating pan type feeders. These units permit the discharging of ore at uniform flow rates and at the same time prevent bridging and holding up in the bin. They can be either mounted or hung from springs by cable. Another application for pan type feeders is for sizing ore while conveying it. In this case, we equip the pan with grizzly bars. With a grizzly feeder, some operators add a third job . . . washing . . . thus feeding, classifying, and cleaning their material with one unit. The Simplicity Vibrating Pan Feeders are very versatile machines, and have helped a good many mines . . . if you have a feeding or bin unloading problem, they can help you, too.

MANUAL REMOVAL OF FOREIGN MATTER IN MINING

Undesirable material cannot always be removed by screening alone; in many cases, the foreign and useful materials are the same size. In such operations, a Simplicity Picking Table, installed in conjunction with Simplicity Screens, can speed the removal of unwanted matter. Simplicity Picking Tables have gyrating decks, built on the incline, and act as conveyors at the same time that they provide work area for sorting. If you need a good method for the manual removal of shale, stone, or other material from ore, write us for recommendations.

TWO JOBS DONE WITH ONE DOUBLE-DECK SCREEN

A double-deck screen can perform two operations instead of one, by scalping on each deck and feeding the scalped material off to separate bins, while fines drop through to storage. The scalped material can then be utilized without further processing, or put through a crusher for reduction. In a midwest mining operation, a Simplicity Double-Deck 6' x 12' M-15 is scalping and grading the tough, abrasive, Taconite iron ore on an extremely fast schedule. Fines are retained, and the gyrating decks feed larger lumps to a cone crusher. The Simplicity machine operates 24 hours a day when necessary. For more details on these Double-Deck Screens, write for Catalog No. 53.

Write for information on any of these pieces of equipment or for Bulletin No. 53

SIMPLICITY ENGINEERING COMPANY

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SALES REPRESENTATIVES IN ALL PARTS OF THE U.S.A. • FOR CANADA: Simplicity Materials Handling Limited, Guelph, Ontario • **FOR EXPORT:** Brown and Sites, 50 Church St., New York 7, N. Y.

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EXIDE-IRONCLAD BATTERIES

Being interviewed is H. A. Fuggiti, Acting Senior Development Engineer

"Here's where the heavy slugs of power come from"

At the Exide Laboratories — **Reporter:** Just exactly what part of the battery is that, Mr. Fuggiti?

Fuggiti: This is the Exide-Ironclad positive plate. And in any battery, power reserve is governed by positive plate area.

Reporter: Then do you mean that Exide-Ironclad Batteries have *more* positive plate area?

Fuggiti: Exactly. You can see that here. The cylindrical power tubes are arranged in a row. So the semicircular sides give an effective plate area one-third more than the plate size.

Reporter: How does that increase power reserve?

Fuggiti: Because there's a bigger working surface of battery plate exposed to the electrolyte. Power response is faster.

Reporter: What does this mean in battery performance?

Fuggiti: It means the battery can provide power to spare for peak power loads as well as a dependable source for continuous loads.

Reporter: Obviously this is an important feature of the Exide-Ironclad Batteries.

Fuggiti: Yes it is, but it's just one of many engineering details that contribute to their long life and high capacity.

Note to battery users: Whenever you order heavy duty batteries or the equipment that requires them, be sure to specify Exide-Ironclad. For detailed bulletin, write Exide Industrial Division, The Electric Storage Battery Co., Philadelphia 2, Pa.

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Saskatchewan *(Continued)*

Corp. according to Louis Ware, president of both the Canadian company and the parent company, International Minerals and Chemical Corp. in Chicago.

Two buildings, including a warehouse, are already built, and a start has been made on shaft sinking. The shaft, to cost an estimated $4-million, is 18 ft in dia. and will extend to about 2600 ft.

Freezing technique will be used, similar to that employed near the city of Saskatoon last year by Potash Co. of America in a shaft sinking operation. Freezing will not be carried to great depth, however, in contrast to the Potash Co. procedure, but freezing will be used at some lower levels at narrow horizons where pilot test hole showed water present.

Potash deposit will be struck at about 3000 ft, penetrating an orebody expected to provide what Ware describes as "ample" supplies for many years. The project is expected to be completed in two and one-half years. He said freight rates will permit the Saskatchewan product to compete with Carlsbad in northern American States. Some of the product from Esterhazy would also go to International's fertilizer and chemical plant at Niagara Falls.

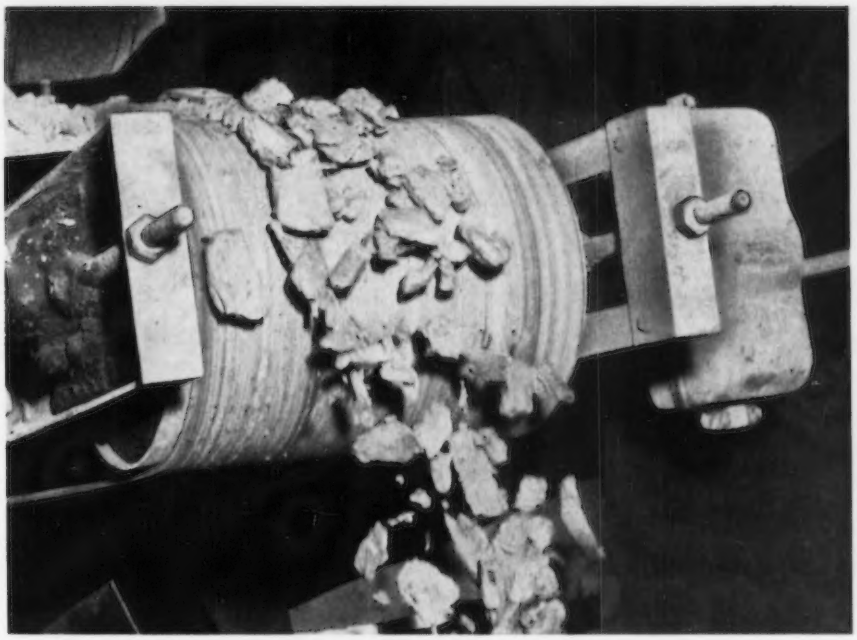
IN LATIN AMERICA

CHILE

Cerro Blanco copper mine, located some 30 miles to the east of Antofagasta, which has been drilled by Mauricio Hochshild during the last three years, has already proved 8¼-million tons of 2% ore and 3-million tons of possible ore. Churn and diamond drilling has disclosed that the ore is distributed in five separate orebodies which can be easily mined by open pit with only 0.7 tons of overburden to every ton of ore. Chief copper mineral is atacamite and pilot plant testing at Antofagasta has already proved that electrowinning is out of the question.

Minus ⅜-in. ore will be leached with sulphuric acid by percolation in a 2,000 tpd plant. Copper will be precipitated from the hot pregnant solution with SO_2 as cuprous chloride. Insoluble white salt will be separated from the solution by filtration and the cake smelted in a reverberatory furnace with coal and lime and finally poled to fire-refined copper. Though some metallurgical details have still to be worked out, pilot plant testing has advanced so far that the main features of the process have already been fixed. It has been estimated that $12-million will be invested before production starts and that copper can be produced for 16 cents.

When the Pirquitas orebody of about 600,000 tons of 3% copper ore was nearing exhaustion, Cerro Negro Co., owner of the mine, started developing the Diablo



One of three 12-in.-dia. by 16-in.-width Stearns electromagnetic pulleys removes tramp iron as conveyor delivers high-quality clay to hopper before final processing.

Largest Clay Producer Takes No Chances with Product Purity . . .

Stearns Magnetic Pulleys Remove Tramp Iron from Ceramic Clay

CHESTER GULICK, *Manager*
Kentucky-Tennessee Clay Co., Inc.

Operating 'round the clock, three Stearns electromagnetic pulleys effectively remove traces of free iron from 300 tons of ball clay daily at Kentucky-Tennessee Clay Company, Inc. Located near Mayfield, Kentucky, the firm is the nation's largest producer of ball clays used in the manufacture of hotel china, art novelties, ceramic tile and sanitary ware.

The Stearns pulleys extract tiny amounts of tramp iron from disintegrated clay prior to grinding and air flotation. Complete and positive removal is important not only for product quality but also for protection of costly processing machinery. Says Manager Chester Gulick, "The Stearns magnetic pulleys enable us to provide customers with a much cleaner finished product than would be possible without such protection.

"Since we installed the Stearns pulleys in 1941, they have done an outstanding, trouble-free job of tramp iron removal. Maintenance has been normal, with no appreciable downtime."

This 16-year record of efficient performance is typical of Stearns equipment in hundreds of processing installations. The Stearns line of *engineered* magnetic pulleys is complete — electromagnetic or permanent types, full range of standard widths and diameters. You can easily select the ideal unit for your application. Call your Stearns representative for details, or write for free literature.

46

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Permanent Magnetic Pulleys - - -	350-CD
Electromagnetic Pulleys - - - -	303-DD

STEARNS MAGNETIC PRODUCTS

635 SOUTH 28TH STREET • MILWAUKEE 46, WISCONSIN

ORE AND OVERBURDEN throughput has been increased by one-third to New Riverside Ochre Co.'s barite operation at Carterville, Ga. Dragline replaced truck fleet.

Georgia Barite Mine Increases Production

INSTALLATION of a new dragline at the Cartersville, Ga. barite operations of New Riverside Ochre Co. has eliminated truck haulage of overburden and increased throughput of barite ore through the mill.

Dragline lifts overburden and casts into an abandoned mine, completely freeing trucks and the shovels formerly used in the pit proper for ore handling. New facility moves 300 yd material per hour against previous 200 and is more efficient in the sometimes difficult terrain in wet weather.

Barite ore is lifted from 75- to 100-ft pits and stacked for weathering. New Riverside has found that seven days exposure before treatment improves breaking and washing in the mill. Weathered ore is shovel-loaded into trucks for the trip to the company mill where it is washed through a double log washer for clay removal, iron is removed by magnetic separators and silica by jigging.

Chile *(Continued)*

section which looks like a down falted portion of the upper or Pirquitas mineralized breccia bed. Already some 4-million tons of 3% copper ore have been blocked-out by the Cerro Negro which will keep its 400 tpd flotation mill operating for many years. Cerro Negro is located near the town of Cabildo in Central Chile and its concentrate will be smelted at the new copper smelter to be located at nearby Papudo or at Quintero.

The Chilean government has authorized local fabricators to export copper-wire to countries behind the Iron Curtain.

Official figures show that Chile exported during the first quarter of the present year $152-million of which total $106-million correspond to copper exports and $6.5-million to sodium nitrate. The medium and small mines exported metals, concentrates and ores to the tune of $13-million. Thus the mining industry accounted for almost 90% of all Chilean exports.

Mining Credit Bank figures show a considerable falling off in the tonnage of copper ores exported during the first six months of the present year which amounted to only 9500 metric tons while in 1955, 43,700 tons were shipped abroad and 61,100 tons during last year. Exports of gold ores show a still greater drop.

Braden Copper Co. has been awarded, for the tenth consecutive year, the Inter-american Safety Award by the New York Council Society.

Last year Chile produced 538,713 short tons of copper, a figure which is very close to the record figures of 1943 and 1944.

According to the Treasury, the fall in the price of copper will decrease the government's income from copper taxes by $37.5-million for 1958.

MEXICO

Black Orchid manganese mine, new property at Montezuma, Sonora, is near operation status with output expected to be 200,000 tons a year in open pit, management reports. Black Orchid is operated by Sirocco Minerals Industrioles, a subsidiary of Oglebay Norton of Cleveland, Minerals Reserve Co. of Douglas, Ariz., and Winter, Wolff, and Co., of New York City.

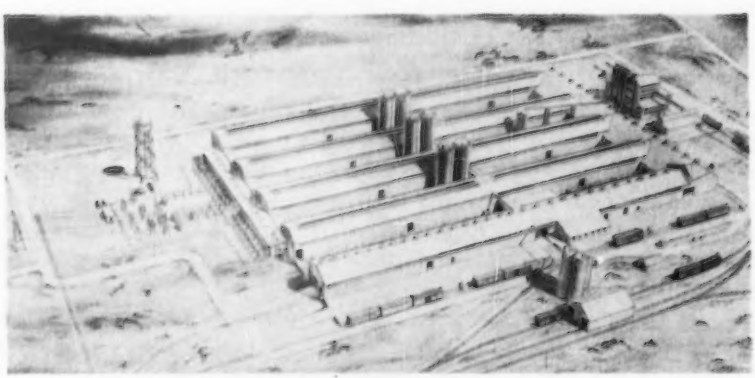
JAMAICA

Jamaica Glass Products, Ltd., a newly formed company, will build a $2.5-million glass manufacturing plant. Extensive silica and quartz mining facilities will also be constructed, with production scheduled to start in about 18 months.

COLOMBIA

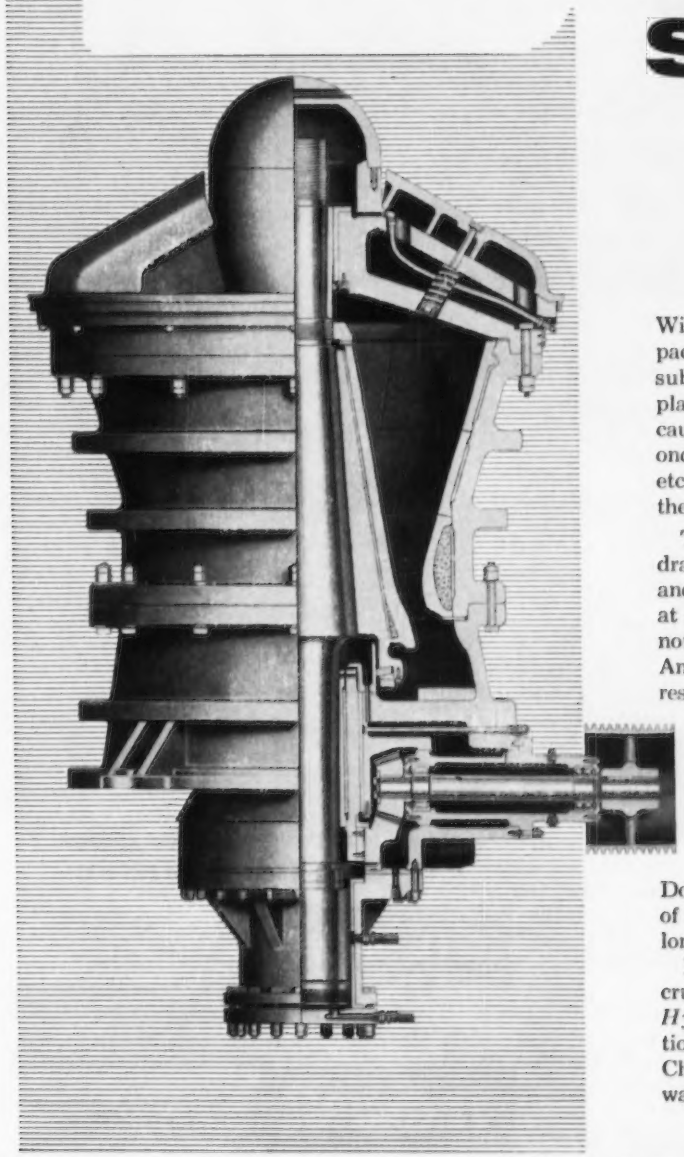
According to the official bulletin of the Ministerio de Minas y Petroleos, the major mineral production in 1956 was as follows in metric tons:

Coal	2,000,000
Coking coal	250,000
Limestone	1,830,600
Cement	1,220,456
Iron ore	394,216
Rocksalt	194,496
Plaster	50,000
Sulphur	5,000
Gold (oz)	438,394
Silver	110,728
Platinum	26,215



JAPANESE ALUMINA will feed the new Harvey Aluminum reduction plant at The Dalles, Ore., which is scheduled to be in partial operation in early 1958. Planned capacity is 108-million lb annually, based on 100,000 tons alumina imported each year. Plant, on the Columbia River, is said by Harvey to be "an improvement upon all smelters now in operation."

Superior
CRUSHER with Hydroset mechanism



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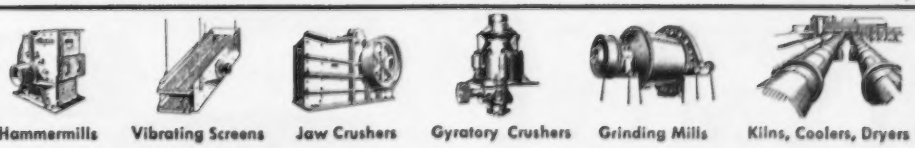

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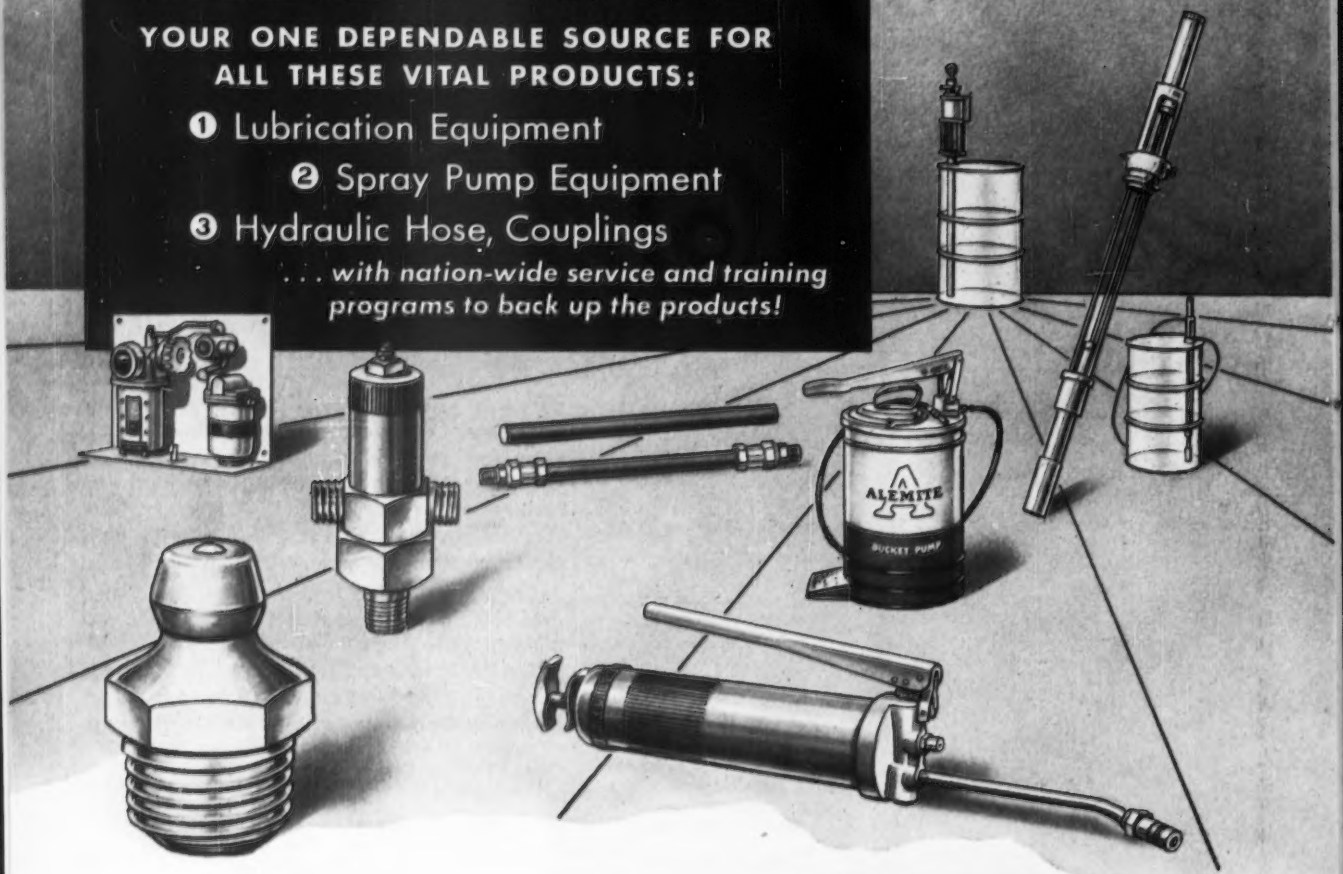

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Take the segmented-type Tru-Rol for example. Each deep-section separator segment is formed to fit the curvature of the roller. Each roller has a separator segment to keep it in accurate alignment. And each roller is crowned to distribute load evenly along the full length of the roller.

That's a lot different from small-diameter, unground spacers staggered at unequal intervals, resulting in rollers rubbing in opposed-motion, and non-uniform roller distribution that can set up out-of-balance vibration and "pulse".

Let a near-by Rollway Service Engineer consult with you on your bearing problems. No charge. No obligation. Just write us. Rollway Bearing Co., Inc., Syracuse, N. Y., *manufacturers of a complete line of radial and thrust cylindrical roller bearings.*

Cutaway view of Rollway Tru-Rol® segmented-retainer roller bearing one of three distinct types of Tru-Rol bearings available.

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☐ Is the retainer roller-supported, to reduce sliding friction?

Retainer Construction

☐ Is the retainer strong enough to withstand shock loads and sudden reversals?

(A Rollway segmented-type steel retainer, such as that illustrated, is the strongest, most durable available in commercial grade bearings.)

Roller Spacing

☐ Are all rollers equally separated, or do some rub against each other in opposed-motion friction?

☐ Are rollers distributed evenly to prevent "pulse" and vibration?

Roller Construction

☐ Are the rollers crowned for optimum load distribution?

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IN AUSTRALIA

The Australian government's Commonwealth Bureau of Mineral Resources is to start a detailed mining survey of New Guinea and Papua to arrest the decline in mining activities and to discover new mineral deposits.

Mineral production in the two territories declined from some $7-million a year in pre-war years to curent $2.8-million although experts think that promising deposits could be discovered in a really thorough search. In the last few years the number of gold dredges dropped from eight to two and little new capital was imported to assist the mining industry.

It is reported that the Australian government is very anxious to promote extensive mining development in the two territories and is prepared to advance funds for mining search and development. It will also give assistance to boring operations as well as provide, on favorable terms, much of the needed equipment. One of the aims is to attract foreign speculative mining investment to New Guinea and Papua.

Mounting costs in the Australian gold mining industry are behind a new plea made by the industry for a payment of a straight-out bounty on all gold produced in addition to the present system of subsidies for marginal mines. Federal authorities are at present examining the subsidy scheme but it is understood that a bounty is not envisaged though subsidy payments may be reorganized to embrace a greater number of gold producing mines.

Expansion of ilmenite output in Western Australia is being stepped up. Cable Ltd. is engaged in the construction of large storage facilities and is preparing to install a new dryer as well as two additional magnetic separators. The rate of output will be eventually about 300 tpd. A plant is also being designed for the separation of monazite, rutile and zircon.

Another Western Australian ilmenite producer, Western Titanium N.L., is also planning expansion. In a few months it will begin the production of monazite, zircon and rutile. Estimated life of the mine is in excess of 30 years on the basis of present costs and metal values even if throughput rate was increased from 200,000 to 300,000 tons of crude sands a year. Current production of ilmenite is running at a weekly rate of 1,400 tons.

Westralian Oil Ltd. reports that testing of the Yoganup ilmenite lease proved 1.3-million tons of concentrate. The proved mineral contained 77% ilmenite containing around 60% titanium oxide. The Capel lease has proved about 900,000 tons to date but only one-sixth of the area was tested and it is estimated that the entire area should prove to have 3-million tons of lower-quality ilmenite than in Yoganup. Current plans

Roebling Royal Blue Wire Rope will **wear** and **wear** and **wear**!

This working quality means longer service life on *your* job. Add to this the fact that Royal Blue is stronger than the strongest rope you have been using and you have two excellent reasons why it has enjoyed faster acceptance than any wire rope in Roebling's history. Your distributor or Roebling Sales Office will give you the complete story, or contact John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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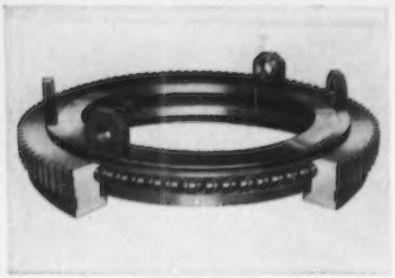

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Turntable is secured to crawler and revolves easily and freely on a huge sealed "ball bearing." No center pin or nut, centering gudgeon or exposed roller path . . . no turntable rollers . . . no constant adjustment, maintenance or lubrication problems.

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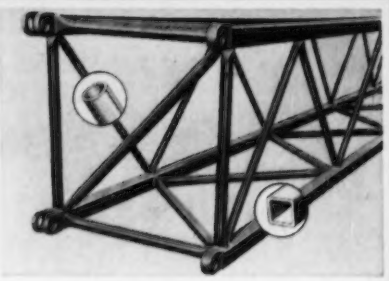
The newest and most effortless of all shovel-crane power controls. "Metered Air" feeds power to clutches at any rate desired — yet operator retains full "feel" of all operations. Fewer levers, fewer motions, faster, smoother, less effort, less fatigue, more output.



SQUARE-TUBULAR-CHORD BOOM*

This new patent-applied-for design has startling advantages over conventional types. Reduces weight and increases lifting capacities. 30-ton crane capacity on 14-ft. long x 13-ft. wide crawlers . . . up to 100-ft. boom, plus tip extensions available.

*U.S. and foreign patents applied for.

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Just like the big 2½-yd. Lorain-85A, the fully convertible 1¼-yd. Lorain-56 gives you the 3 big Lorain features that will mean more profits on any job. You get greater operating ease, longer life, higher production, reduced maintenance . . . plus increased crane capacities with these "Big 3" features.

There are many other "56" advantages, too, that make it an exceptional value in the 1¼-yd. class. Here are a few: full air control of crawler operations . . . hoist and swing drums and travel shaft on anti-friction bearings . . . torque converter power-take-off . . . choice of two crawlers . . . crane capacities up to 30 tons available . . . a new, interchangeable hoe with dipper widths from 36" to 48" . . . and there are many more.

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Employing a unique mechanically operated "Micro Thrust" exciter unit, Dravo-Schenck screens, feeders and conveyors have a wide variety of applications in the handling of chemicals, cement clinker, ferrous and non-ferrous sintered ores, coal, crushed stone, abrasive or other difficult-to-handle material. The helical type conveyor operates vertically in a space saving spiral and handles bulk material up to four inches in diameter.

Our engineers will confer with you on specific problems. Complete information on this equipment is available. Write for Bulletin No. 1475, Dravo Corporation, Pittsburgh 22, Pennsylvania.

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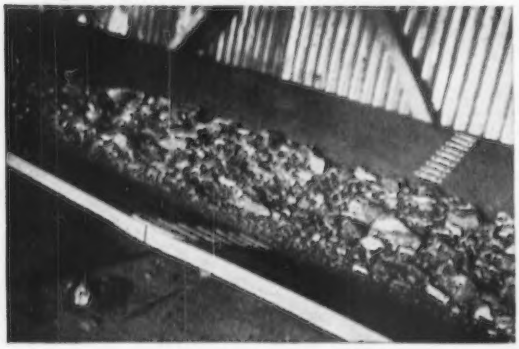

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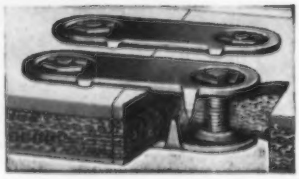


Compression Grip distributes strain over whole plate area

Order From Your Supply House. Ask for Bulletin F-112

FLEXIBLE STEEL LACING CO., 4635 Lexington St., Chicago 44, Ill.

Australia *(Continued)*

are for a production of about 100,000 tons of concentrate a year.

South Alligator Uranium N.L. has struck high-grade ore in the 400-ft east winze at its Rockhole mine in Northern Territory. From 6 to 20 ft in the winze, ore averaged 4.5% uranium oxide. Winze, which is 100 ft east of 300 E. winze, is down 20 ft below the floor of No. 2 adit. The company hopes to have the Rockhole mine in profitable large-scale production before the end of 1957.

New hopes are being expressed for the Maranboy tin field which is considered to be of considerable importance. Development was rewarded by numerous titles held by different companies and individuals but a group comprising United Uranium, Loloma and King Island Scheelite, three successful Australian companies, has been granted the authority to prospect over the whole of the field. Testing of deposits will begin without delay.

Consolidated Zinc Pty. Ltd. is stepping up its investigation of the huge bauxite deposits on the west coast of Cape York Peninsula. Its parent company has just announced a drop in net earnings for year ended December 31. Profits dropped from £stg2,344,928 to £stg2,044,383, mostly because of increased provisions for tax, mining royalties and depreciation.

Net profit of Great Boulder Pty. Gold Mines Ltd. rose from £A216,369 to £A258,512 in the year ended December 31. During the year, ore treated rose from 473,288 tons to 489,494 tons and gold content from 115,581 oz to 124,604. At the close of the year, ore reserves were estimated at 2,071,500 short tons with average assay value of 5.5 dwt, an increase in both quantity and quality on 1955 figures of 2,068,400 tons with a value of 5.42 dwt. High grade ore has been discovered in developmental work.

The development program of Coffs Harbor Rutile N.L. is proceeding to schedule. Mining plant construction is well advanced and the dredge has been completed. Opening up of the dredge paddock exposed a heavy seam of mineral confirming the boring results.

Crescent Rutile N.L. is finishing the erection of plant at Kilcare in Kincumber. Concentrating tables and spirals are being erected and closer boring is adding to the tonnage of mineral discovered in earlier boring.

IN AFRICA

Government-owned Rhodesia Railways are looking for a mining company or

Shown here is one of two Bucyrus-Erie 51-Bs working in an open-cut at a large copper mine in western U.S.

Fast-Working Shovels Help Make Open-Cut Mining Economical

In this open cut at a large Montana mine, two Bucyrus-Erie 51-Bs load out granite and copper ore economically every day.

Like other Bucyrus-Erie excavators, these 2-yd. 51-Bs get their traditionally fast cycle from a combination of features — including careful balance of speed and power with constant response from clutches and brakes that lets the operator smoothly coordinate every shovel movement.

There is a minimum of pull-down due to sudden loads, with fast recovery of engine speed — extra lugging power, too, at slow speeds.

When you need a shovel with the output ability to make your ore rock pay off, see your Bucyrus-Erie distributor for complete information about the 51-B and other excavators in sizes ranging from ⅜- to 4-yds.

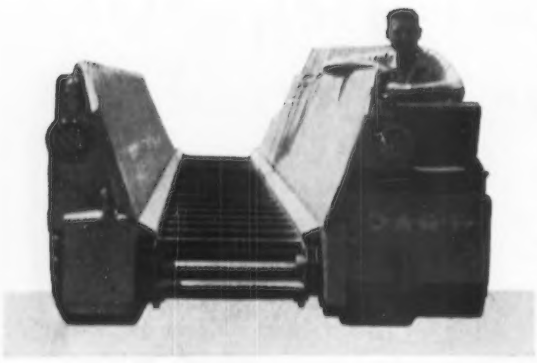
371E57

A Familiar Sign . . . BUCYRUS ERIE ***. . at Scenes of Progress***

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

DART'S NEW Underground SHUTTLE TRUCK

13 TON CAPACITY...
COMPLETE DIESEL—MECHANICALLY DRIVEN



Another member has been added to the family of Dart Underground Shuttle Trucks which have proven highly successful in a number of underground applications. This Dart Model 13S-UG is powered by a Hercules DRX-501 136 HP Diesel engine with a Dart designed exhaust scrubber (optional—Cummins JN-6 125 HP Diesel engine) and Allison Torqmatic transmission. Timken Drive steering axles provide four-wheel drive and four-wheel steering. Hydraulic steering by front wheels alone or combined steering of front and rear wheels enable the truck to "crab" and maneuver in close quarters. Driver's compartment provided with dual shuttle controls.

A flight type conveyor extends the entire length of the body. It is hydraulically driven. Truck length 24'. GVW with 26,000 payload, 51,000 lbs.

HEAVY DUTY TRUCKS EXCLUSIVELY SINCE 1903

DART TONNAGE ENGINEERED TRUCKS

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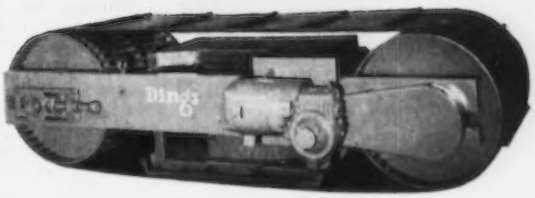
D-134

NEW DINGS METAL DETECTOR

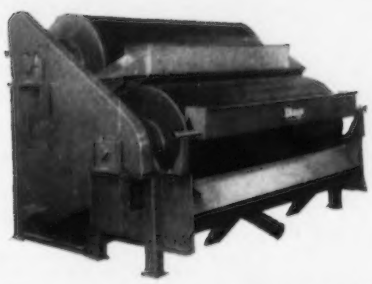
Now . . . a positive, low-cost method for protecting valuable processing machinery against tramp metal damage. This simple, easily installed Detector will detect the presence of all magnetic metals — as well as weakly magnetics such as manganese — even in extremely deep burdens. Completely self-contained, with 30 feet of cable for remote control.



DINGS RECTANGULAR SUSPENDED MAGNET

For pulling iron from fastest belts, deepest burdens, here's the mightiest member of Dings force — RM models available to pull iron through 30 inch air gap. New Dings RM uses less current, weighs less in proportion to strength — Compact design takes less room, dissipates heat faster.

Remove Tramp Iron and Reduce Processing Costs with these 4 efficient DINGS PRODUCTS



DINGS WET DRUM SEPARATORS

For maximum efficency and economy in all classes of heavy-media separation and direct concentration service, Dings offers a full line of wet drum magnetic separators to meet your specific requirements. Backed by over 50 years of specialized experience and proved performance.

DINGS MAGNETIC PULLEYS

Powerful, air cooled electro magnetic pulleys are ideal for conveyor belts with heavy burdens. Installed as head drive pulley, tramp iron is discharged automatically. Low operating cost, long life and maximum range characterize this workhorse of the Dings line.

Dings *non-electric, self-energized* Perma Pulley magnets are recommended where burden depths do not exceed 3".

Dings

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LARGE SIZE WIRE

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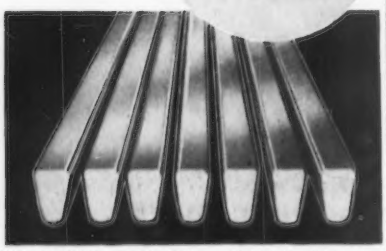

WEDGE-WIRE profile F217 - .312 high, .187 wide
F250 - .375 high, .191 wide

Especially designed for extended life in abrasive applications. Possesses the necessary construction features to easily maintain openings from ½ inch to as close as 1 m.m. Available in many metals. Furnished in guard bars and special shapes or designs. Adaptable to vibrator applications.

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*INDEPENDENT FLEXING ACTION—Unique construction permits individual wires to "flex" independently for greater screening capacities and abilities while maintaining "rigid" requirements.

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WEDGE-WIRE CORPORATION
Wellington, Ohio

Africa *(Continued)*

companies to exploit minerals in the Vryburg and Kuruman areas of Northern Cape Province, Union of South Africa.

Mining firm will have to spend an average of $300,000 a year for five years in return for exclusive rights to mine all minerals in the 6,600 sq mile area (minerals include: gold, diamonds, iron ore, lead, zinc, chrysotile asbestos, manganese, Cape Blue asbestos and limestone).

Rhodesia Railways will claim a royalty (amount of which still to be decided), and will also retain the right to participate in up to 10% of the issued capital of any company floated to extract minerals in the area.

Billiton, jointly with Olin Mathieson Chemical Corp., Aluminium Industrie A.G. of Zurich and Vereinigte Aluminium Werke A.G. of Bonn has acquired exclusive exploring rights on an area of 25,000 sq km in Angola for bauxite. Billiton's bauxite production in Surinam will be raised from 800,000 to 1,250,000 tons annually.

Billiton's subsidiary, Mbeya Exploration Co. in Tanganyika, has struck 45-million tons of ore with 0.3% and over 1-million tons with 1% of columbium pentoxide—an experimental factory is in course of erection. Company says that columbium metal, due to its high melting point, can be used wherever high temperatures are to be applied, such as in the building of gas turbines. The metal also offers possibilities for the construction of nuclear energy installations.

Value of mineral production in Southern Rhodesia during the first seven months of this year shows an increase of $2,800,000 over production in the corresponding period of last year. Production to July 31 last year totalled $37,520,000 and this year $40,320,000.

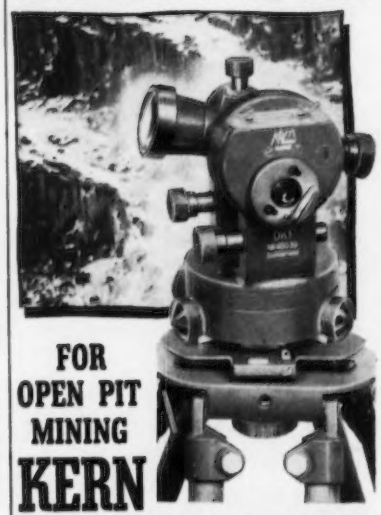
United Kingdom Atomic Energy Authority are ready to buy annually from existing or future mines in Kenya, Uganda, Tanganyika, Swaziland and British Guiana chemical concentrates containing up to 500 short tons of uranium oxide. Contracts would cover a ten year period from the coming into production of a mine, providing that the end date of the period does not extend beyond 1972.

IN THE PHILIPPINES

Palawan Consolidated, a comparatively new chromite producer controlled by Marsman & Co. has received orders for 1500 tons of ore for shipment to U. S., as well as contracts for shipment of 3,200 tons of high grade metallurgical ore to Europe in September. It appears likely that shipments to the Continent will increase if Washington cuts down on its chrome purchasing program.

Lepanto Consolidated continues to maintain its normal production rate of cop-

KERN INSTRUMENTS
RIGHT for the JOB



FOR OPEN PIT MINING KERN DKI THEODOLITE

Down-to-fundamentals design ... made for portability, rugged use ... Precision results in simplest, quickest way.

Only 6 lbs. in weight, 7" high, including carrying case.

READINGS at a GLANCE
- Fast, effortless operation.
- Direct to 10'. Estimation to 1'.
- Automatically gives arithmetic mean of two readings at opposite circle points

FOR UNDERGROUND OPERATION
- Illuminated Traverse Targets easily interchanged with instrument.
- Water and dust-proof.
- Exceptional clarity of optical system—50% brighter image through Kern AR coating.

★

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FACTORY TRAINED PERSONNEL
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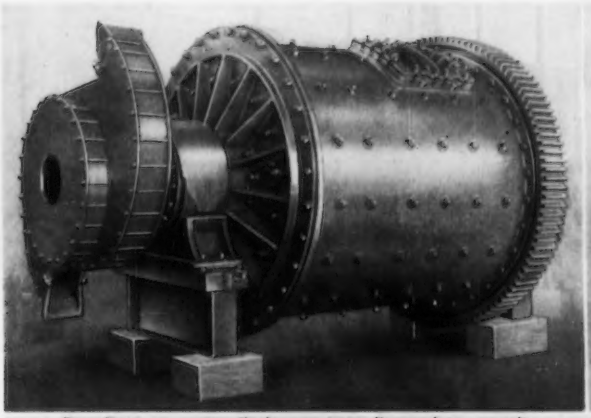
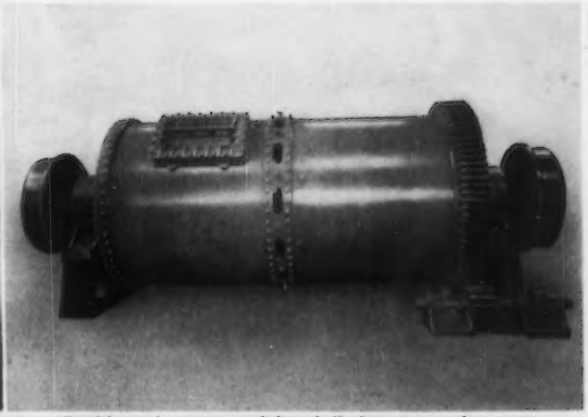
STRAUB MILLS

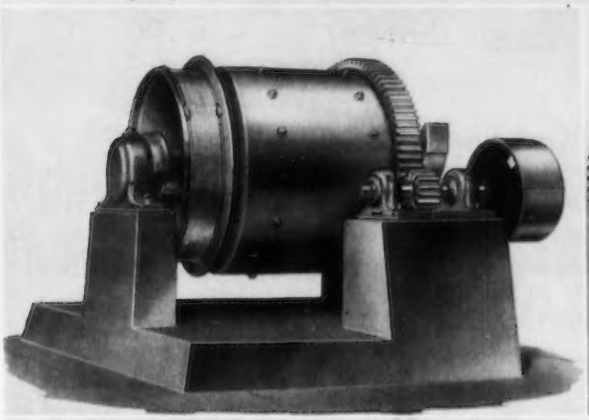
with advanced features at no extra cost!



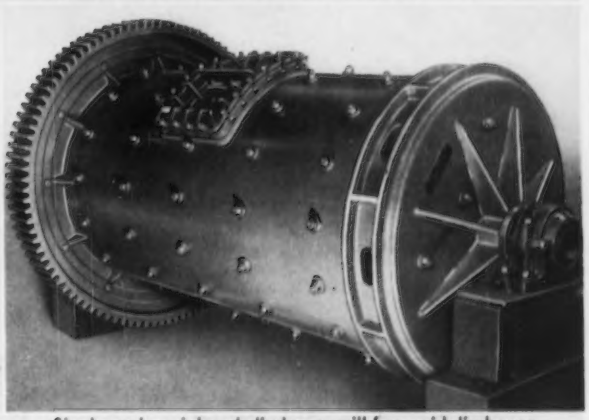
Overflow or grate discharge type flanged to permit extending length.



Double end, center peripheral discharge type for most granular product with minimum amount of fines.



Screening mill delivers a sized product. Unequalled for producing granular product within the limits of screening.



Single end peripheral discharge mill for rapid discharge granular product.

ALL STEEL CONSTRUCTION — For over thirty years, Straub has pioneered all steel design for maximum strength and freedom from breakage. Less weight reduces shipping charges and H.P. requirements.

MANGANESE LINERS permit thinner sections when new for increased mill volume and capacity. Manganese can be worn thinner for longer life and less scrap loss. Spiral rib liners standard. Any other design available.

LARGER, SELF-ALIGNING BEARINGS assure low bearing pressures for long life. Self-aligning takes care of minor inaccuracies in foundation and any shell deflection during operation. Pinion bearings unitized ring oiling type or antifriction self-aligning type.

REVERSIBLE MAIN GEARS permit wearing both sides of teeth. Furnished steel cut tooth, semi steel cut tooth or cast tooth depending on size and type of mill. Pinion gears are cut tooth, heat treated steel.

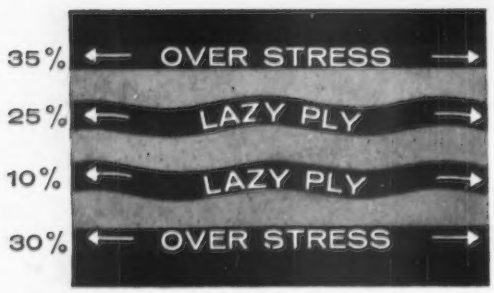
BALL OR ROD MILLS AVAILABLE — Plain overflow, grate discharge, single end peripheral discharge, double end center peripheral discharge, screening mills, extensible mills — standard or sectionalized construction for difficult transportation. Capacities from 2 tons per day and up.

We also build: KUE-KEN® JAW CRUSHERS
KUE-KEN® GYRATORY CRUSHERS

Send for catalogs **STRAUB MFG. CO., INC.** 8388 Baldwin St., Oakland 21, Cal.

STOP PAYING FOR "LAZY" PLIES THAT SHORTEN BELT LIFE!

BOSTON'S Balanced Belt Construction equalizes stress!



CONVENTIONAL BELT CONSTRUCTION

BBC-BALANCED BELT CONSTRUCTION

BBC — Balanced Belt Construction equalizes ply stress — every ply pulls its full share of the load! BOSTON'S exclusive manufacturing methods eliminate "lazy" plies which put extra strain on other plies and cause premature rupture and belt failure.

BBC is the result of two advanced BOSTON processes: *Electro-Tensile Control,* which electronically controls ply tension; and *Rotocure* the only continuous method of vulcanization, which assures uniformity throughout the belt.

With Balanced Belt Construction, BOSTON belts set entirely new standards of longer, trouble-free service and greater economy.

Your BOSTON man will be glad to demonstrate the advantages of Balanced Belt Construction to you!

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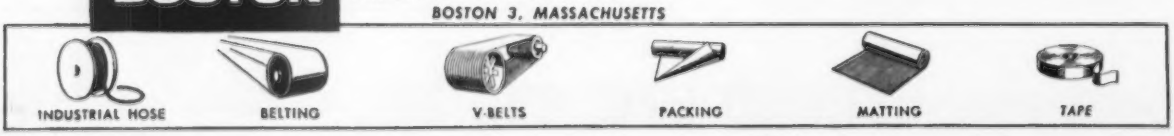


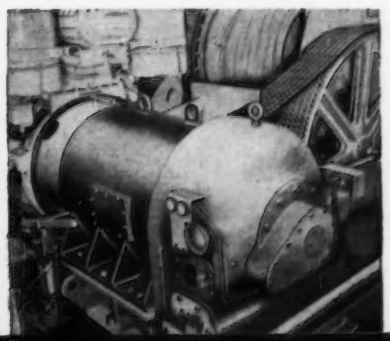
LIMA Type 2400 with Torque Converter moves overburden faster at lower cost

The torque converter, standard equipment on all LIMA Type 2400 machines, is another of the quality features that enable LIMAS to outperform and outlast ordinary machines. It automatically increases torque as required by the load, making higher output possible by avoiding stalling and making performance much smoother and faster.

For assignments calling for an electrically-powered 6-yard machine, the LIMA Type 2400 is available with complete electrical power package. Combining a single AC electric motor with a single stage torque converter, this drive matches, *electrically,* diesel-torque converter performance. You get maximum power performance under all operating conditions . . . and the motor won't stall or burn out.

Cable life is increased and machinery maintenance reduced because shock loading is minimized as the oil in the converter cushions any sudden blow. Friction clutches last much longer because the torque converter reduces friction clutch slippage during acceleration.

LIMA quality design and construction extras make for profitable, efficient operations with minimum downtime. There's a LIMA type and size for every job—shovels ½ to 6 cu. yds., cranes to 110 tons and draglines variable. Smaller capacities are available on rubber. For full details, contact your nearby LIMA distributor, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.



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Construction Equipment Division — LIMA WORKS

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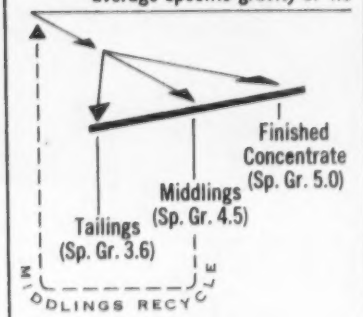
CAN THIS BE YOUR PROFITABLE "FINISHING TOUCH"?

Currently, one of the most significant applications of *dry concentration by fluidization* (with Sutton Gravity Separators and Stoners) is the finishing or upgrading of mineral concentrates and semi-concentrates to premium specifications.

Typical Dry Concentration from SS&S Laboratory Records

Plus 35 mesh Monazite rough concentrate with average specific gravity of 4.0



Other examples: to raise Zircon to over 66%; to raise Manganese from 15% to 40%.

For any job your present mill procedure cannot finish, check with Sutton.

For additional information, write Dept. EM, Sutton, Steele & Steele, Inc., 1031 South Haskell, Dallas, Texas

SUTTON, STEELE & STEELE, INC.

SEPARATIONS

Philippines *(Continued)*

per and gold. From milling 37,110 tons in July the company recovered 2,350,320 lb of copper and 3,534 oz gold, from ore averaging 3.33% copper and 0.119 oz gold per ton. C. B. Foster is general superintendent at the property in Morentain Province, and L. A. Dahners is mine superintendent.

Atlas Consolidated, now the Philippines No. 1 copper producer, established new milling records in July at its Toledo mine in Cebu. Output was 3,601,322 lb copper from 316,554 tons milled, an average of 14,400 tons milled in 22 working days. Shipments during the month were valued at $804,000, all to Japan. In addition, nearly 16,000 tons of iron ore were shipped from the company's Mati property in Davao.

Mindanao Mother Lode treated 8,500 tons of copper ore at its Zambales mill in July, averaging 2.77% copper. Gross value during the month was $130,000.

An official report by Earl Irving, former chief of the mining division of the U. S. foreign operations mission in Manila, is highly optimistic over the future of Philippine copper production. Systematic survey now completed of copper resources indicates that present production has reached a total of 30,000 tons annually from 125- to 150,000 tons of concentrates, and the prediction is made that during the next five years, Philippine copper production will climb to 60- to 75,000 tons per year.

IN EUROPE

AUSTRIA

Austria's most valuable emerald was found recently in the Halbach Valley of Salzburg province. Estimated at 180 carats, the gem will possibly net $77,000.

BULGARIA

Bulgaria today produces much more ore and minerals than necessary to cover internal needs.

First authentic production figures for 1956 were given by Tano Tsovo, Bulgarian Heavy Industry Minister on the occasion of the 1957 Bulgarian miner's day.

During 1956, Bulgaria produced 470,324 metric tons of copper ore, as against 32,440 metric tons in 1944. Output of lead and zinc ore was 1,670,678 metric tons during 1956, and 93,630 metric tons in 1944. Iron ore output was 236,200 metric tons in 1956 (1944: 6,760 metric tons).

Bulgaria now operates 13 flotation centers with a combined annual capacity of 2,454,500 metric tons, as compared to the pre-September 9, 1944 (Liberation Day) level of three flotation plants with together 270,000 metric tons.

Bulgarian mineral deposits as of July

WEIGH WITHOUT STOPPING

WHILE YOU **CONVEY**

Yes, weigh and record with the —MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service. Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

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BOOTIES **$3.95 pr.**
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Absorbs perspiration and moisture—eliminates clamminess and chills. Extremely lightweight. Famous TEMP-TRON insulation exhibited this year by U.S. Dept. of Commerce at Posnan, Poland and Salonikas, Greece Int'l Trade Fairs. Acclaimed by enthused sportsmen and outdoor workers everywhere.

Sizes S-M-L-XL
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Gardner-Denver self-propelled "MOBILJUMBO" drilling on the third level of the Algom Nordic

Gardner-Denver goes underground with Algom Nordic

You find Gardner-Denver equipment in so many important mines like the Algom Nordic because mining men know it's equipment that stays on the job and helps keep ore production hustling from mine to mill.

Algom Uranium Mines Limited uses the following Gardner-Denver equipment at the Algom Nordic Mine:

3 JSP "Mobiljumbos"®
2 sets of tractor mounted drills, booms and remote controls
24 JBT hydraulic booms
24 CM93 drifters on 12-foot-change chain mountings
3 Gardner-Denver RP600DB portable compressors
Grout pumps and other equipment

Write for Bulletins

Tractor mounted with Gardner-Denver hydraulic booms, drills and remote controls.

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IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

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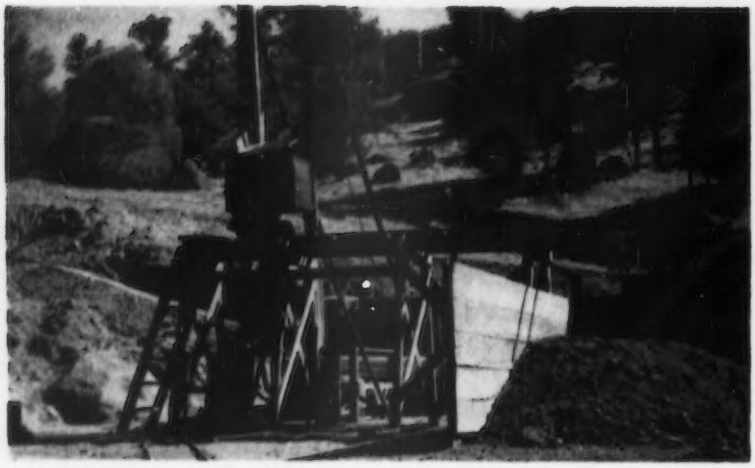


URANIUM ORE from present Kern workings is stacked near the headframe (right).

Kern Uranium Extends Shaft to 160 Feet

Little Sparkler mine, in Kern River Canyon, Calif., will extend its shaft from the present 60-ft level to the 160 level, according to Lloyd Scouler, president of Kern Uranium Co., Bakersfield. The mine is about 60 miles northeast of the city.

Workers are drifting both ways from the cross-cut leading from the shaft at the 60-ft level. Drifts are approximately 100 ft in each direction along a well-defined and straight fracture with a good hanging wall, Scouler says. The first ore shoot on which the company has a fairly complete analysis shows ore widths running from 10 to 30 in. over a length of 40 ft. with the average value running at approximately 0.1% U_3O_8. Other higher value zones have been opened along the drifts, but full reports are not available yet. Company geologist Allen Scouler is mapping underground work. Ore appears to be predominantly pitchblend, with much less secondary mineralization than was mined from surface out-croppings. Kern Uranium is currently running two shifts per day with 13 men on the payroll.

Bulgaria *(Continued)*

1, 1957 were reported as follows: about 270-million metric tons iron ore, 50-million metric tons of lead-zinç ores, and more than 30-million metric tons of copper ore.

GREECE

'Oesterreichisch-Amerikanische Magnesit A. G. Radenthein' last month took over the North-Greek magnesite mines of Vavdos. Radenthein company has handed over the newly acquired property to its sister company, 'Magnomin A.G.', Zurich, for exploitation.

Vavdos mine has been deactivated for the past five years. One rotating furnace exists at mining site. The Swiss magnesite company has already started mining magnesite at the rich deposits as well as to repair the defunct furnace. Furnace will be ready by the beginning of 1958 and sufficient raw material reserves are to be on hand by that deadline.

HUNGARY

Gallium has been separated from lye used in the manufacture of alum earth, Hungarian reports claim. Engineer Elmer Papp of the Metal Industry Research Institute termed the discovery of the new process especially valuable in view of gallium's use in the atomic energy field.

Mr. Papp and Engineer Joszef Ueveges worked since 1953 and so far have produced 30 grams of Ga in the Institute's laboratory. 10 cubic meters of alum earth lye will yield 1 kg of Ga metal. In Hungary's aluminum earth processing plants, about 10,000 cubic meters of such lye is constantly available.

Plans for a factory have been drawn up. Plant's capacity would be 2 kg of Ga metal per month.

POLAND

Huge ground formations were displaced in Piaseczno, Kielce district, to reach large sulphur deposits there. 127,000 cubic meters of earth had to be excavated, and over 5-million cubic meters of water were pumped out of the construction site. Work done so far in preparation for the industrial-level of mining has gained Poland a few metric tons of sulphurous ore. Analyses conducted in the Acid Institute of Warsaw revealed that ore contains between 20- and 25% pure sulphur.

IRELAND

Research team from the Geophysical Prospecting Co. of London is in County Armagh, Northern Ireland, exploring possibility of opening old lead mines there.

USSR

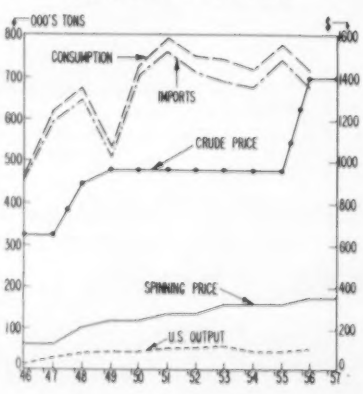
New tellurium extraction process, used for the manufacture of semi-conductors, was reportedly worked out in Soviet Central Asia. Process will make possible a large tellurium yield increase which leaves only 5% tellurium in the waste piles.

Vast gypsum deposits have been found in the Angara Steppe, several kilometers from district center of Nukuta. Deposits of more than 10-million tons have already been prospected and made ready for exploitation, which, at full capacity, will yield over 300,000 tons of gypsum a year.

Plans have been drawn up for the construction of new Siberian power stations which will furnish cheap energy for that area's future steel and aluminum processing plants, **Industriekurier** reports.

Mineral and Ore Markets

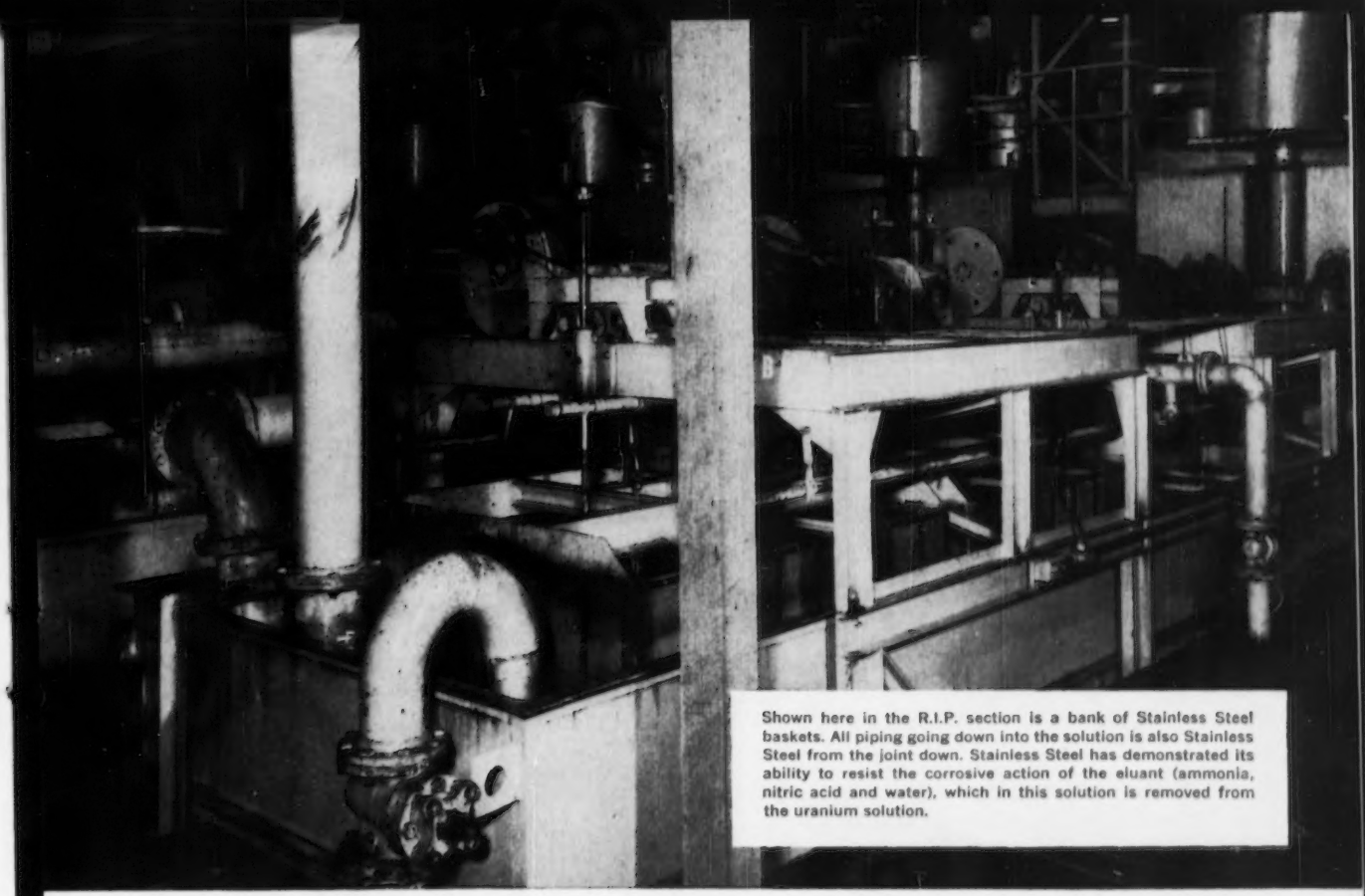
Asbestos 1946-1957



Prices are those published in *E&MJ* and collected from sellers; they are f.o.b. Quebec. They were in effect Jan. 1 of each year and are the lowest of the range shown. The crude price refers to crude No. 1; the spinning price is for spinning fibers. The consumption and import data are for the U. S. and are taken, as are the U. S. output figures, from U. S. Bureau of Mines statistics.

ASBESTOS CONSUMPTION is dominated by the construction industries. Its use is likely to be high in those years when new housing, industrial and commercial construction and repair and remodeling are at high levels.

Consumption dropped during the 1949 recession according to U. S. Bureau of Mines data (see chart). The extremely



Shown here in the R.I.P. section is a bank of Stainless Steel baskets. All piping going down into the solution is also Stainless Steel from the joint down. Stainless Steel has demonstrated its ability to resist the corrosive action of the eluant (ammonia, nitric acid and water), which in this solution is removed from the uranium solution.

"Without Stainless Steel certain phases of this milling operation would have been impossible on a practical basis"... reports an official of Uranium Reduction Company, Moab, Utah

At the Uranium Reduction Company plant, uranium ore is custom-milled to a finished product assaying 75% U-308. To combat corrosive conditions occurring at various stages during the milling, Stainless Steel has proved the only practical material to use.

The ore is first crushed to minus two inches, then to minus one inch. It is next reduced to minus 28 mesh by wet grinding. The uranium in the ore is dissolved by treating the ore with sulphuric acid for approximately 16 hours. After this leaching process, the slurry is pumped to the de-sanding units where Stainless Steel finds one of its most extensive applications. Because of its unique resistance to corrosion, Stainless Steel is used for the large blades in the machines that separate sands from the fine particles. All exposed metal coming in contact with the acid mixture must be made of Stainless Steel to resist corrosive action.

From the de-sanding section, the uranium-bearing fine-mesh slurry is pumped into the R.I.P. (resin-in-pulp) section. Here the resin picks up the dissolved uranium and holds it while the waste material is pumped off. In this section are 28 banks, each bank containing four Stainless Steel woven wire baskets. All supporting angle irons, nuts, bolts, and piping which are immersed in the acid solution are made of Stainless Steel. Other acid-resistant materials do not have the properties to withstand the processing this product must undergo.

In summing up the reasons for using Stainless Steel so extensively, Uranium Reduction metallurgists state that "The use of Stainless Steel benefits processing because the R.I.P. section would be impossible to maintain without Stainless. If it were not for Stainless Steel, there would be no finished product."

United States Steel Corporation, Pittsburgh · American Steel & Wire Division, Cleveland · Columbia-Geneva Steel Division, San Francisco
National Tube Division, Pittsburgh · Tennessee Coal & Iron Division, Fairfield, Ala. · United States Steel Supply Division, Warehouse Distributors
United States Steel Export Company, New York

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Sheets · Strip · Plates · Bars · Billets · Pipe · Tubes · Wire · Special Sections

USS

UNITED STATES STEEL

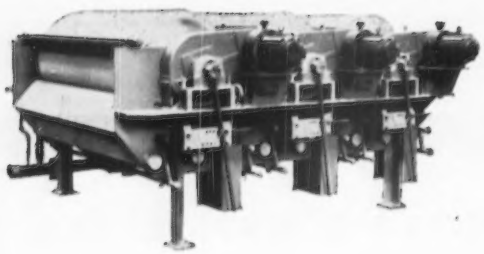
For wet concentration and magnetic recovery,

JEFFREY DRUM-TYPE SEPARATORS

Extremely Simple: The drum is the only moving part and there are no slip rings or contact brushes. An entire plant can be handled by one man.

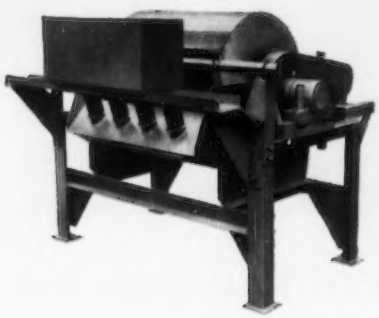
Highly Efficient: Close clearance between magnet poles and drum result in very little magnetic loss. Alnico permanent magnets can often be substituted for electromagnets.

Easily Adjusted: Intensity and depth of magnetic field can be suited to various separation problems by mechanical and electrical adjustments.



Finishing Type Separator

Provides a strong, positive washing action, since materials washed from the drum go back into the feed well for re-separation. Double or triple-drum counterflow finishing separators can be adjusted to deliver a middling product clean and substantially free of tailings and concentrate particles.

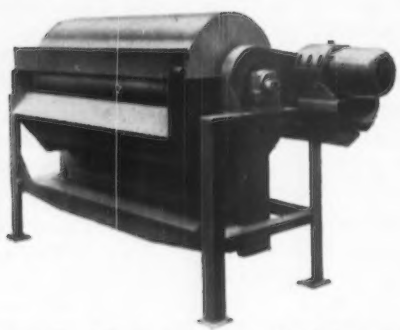


Type CO Separator

This counterflow overflow type was designed for the recovery of magnetic medium in a standard heavy-media plant. Compact, it saves floor space and headroom. Has extremely high capacity both from a pulp volume and magnetic solid carrying-capacity standpoint and also produces tailings extremely low in magnetics.

Type CS Separator

The spigot design differs from the Type CO in that a spigot discharge is provided for the relatively coarse particles. It is designed for use in fine ore treatment plants, where it is necessary to pass the sink and float products through magnetic separators, instead of relying upon drainage screens to remove the medium from these products.



Type C Magnetic Cobber

A high intensity unit for producing tailings of lowest possible magnetic iron content. Eliminates barren gangue in coarse sizes, thereby cutting grinding costs; lowers plant tailings.

THE JEFFREY MANUFACTURING COMPANY
819 North Fourth Street, Columbus 16, Ohio

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION MACHINERY • CONTRACT MANUFACTURING

• Hosing off Permutit SKB resin beads in baskets of R.I.P. bank at Edgemont, South Dakota mill of Mines Development, Inc.

Edgemont R.I.P. mill loads 4 lb. of U_3O_8 per cu. ft. of Permutit SKB resin!

• Here's how low-slime pulp and Permutit SKB ion-exchange resins are producing at Mines Development's efficient mill: a loading of 4.0 lb. of uranium oxide per cu. ft. of resin, a concentration of 10 to 12 grams of uranium oxide per liter of eluate, and an R.I.P. uranium recovery of 99.7 per cent with a minimum of iron, vanadium and aluminum impurities.

It's proof of Permutit SKB resin's high uranium capacity and recovery ratio under actual production conditions. It explains why a number of R.I.P. mills have switched to this unique resin.

Permutit SKB was developed especially for R.I.P. uranium extraction. It disperses well, preventing "blinding" of the baskets and improving resin-pulp contact. Its unique chemical structure gives it fast loading for high recovery, high capacity and fast elution. This results in extremely high concentrations of recovered uranium, particularly in nitrate elution systems. It also means low precipitation costs and a high purity uranium.

Permutit SK (finer mesh than SKB) offers the same chemical advantages when used for uranium extraction in ion-exchange columns.

We'll supply full details and samples to help you evaluate Permutit SK, SKB or other ion exchange resins. Write: The Permutit Company, Dept. EMJ-10, 330 W. 42nd Street, New York 36, N. Y. or The Permutit Company of Canada, Ltd., Toronto 1, Ontario.

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ION EXCHANGE for Water Conditioning
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You'll save with lightweight Bemis FLEXIPIPE®

For your ventilating job, specify **Bemis Nyprene FLEXIPIPE,** the "featherweight" flexible tubing that is also amazingly tough and durable and is not affected by acids.

Bemis Nyprene FLEXIPIPE is easy to install, handle, store, transport and dismantle. You'll find it will save you money, too.

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Also . . .

Jute-Grade FLEXIPIPE®
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All three grades of FLEXIPIPE available with Bemis Rope Seam Suspension *at no extra cost.* No horizontal wires, vertical collars, hooks or other gimmicks.

Write, wire or phone for full information about Bemis FLEXIPIPE®

Bemis

408-E Pine Street
St. Louis 2, Missouri

Asbestos *(Continued)*

high level of new housing construction has been largely responsible for the high consumption since World War II. Heavy industrial and commercial construction has also contributed. During the 1930's asbestos consumption was about a fourth of use in the past few years.

The rather low level of residential housing construction has reduced consumption relative to the high 1955 rate; 1956 was down somewhat and final figures for 1957 may show it down further. However, some firms selling asbestos products say there has been an increase in house remodeling that will partly offset the fall in residential construction.

Asbestos producers look forward to a rise in construction activity. Some asbestos product makers believe the U. S. government should insulate the housing credit market from other money markets and thus guarantee lower mortgage rates. There is some belief that lower down payments could also stimulate residential housing.

Recently FHA raised its allowable mortgage rate from 5% to 5¼%; this was intended to funnel scarce loan funds into housing. Presumably lenders were investing funds elsewhere and the low rates in housing restricted building. But many doubt that this was significant. Also, FHA reduced the permissable discount rate (the discount is the amount by which the funds loaned the borrower are less than the stated amount), offsetting the higher permitted mortgage rate.

But the low level of building currently reflects in part a catching up on the backlog of housing demand that accumulated during World War II.

Many potential new house buyers are unwilling to pay the high prices required for better houses. One seller of building products pointed out that in some fields a recession is accompanied by falling prices but that construction costs have continued to climb rapidly in the weak market.

Many factors say the shortage of asbestos is over; certainly at present there is something of an oversupply. New firms are entering the field and other companies could increase output if necessary.

Asbestos Buyers

American Asbestos Textile Corp., Strawbridge & Sterigere Sts., Norristown, Pa.

Asbestos Textile Co., Inc., 165 W. Wacker Drive, Chicago 1, Ill.

Asten Hill Mfg. Co., Henry & Roberts Ave., Philadelphia, Pa.

Carolina Asbestos Co., Davidson, N. C.

Ehret Magnesia Mfg. Co., Valley Forge, Pa.

Garlock Packing Co., 250 Main St., Palmyra, N. Y.

Johns-Manville Sales Corp., 22 E. 40th St., New York 16, N. Y.

Keasbey & Mattison Co., Ambler, Pa.

Mundet Cork Corp., 7101 Tonnelle Ave., North Bergen, N. J.

Pabco Products, Inc., 1550 Powell St., Emeryville, Calif.

(Continued on p 208)

Yes, it will be appreciated for a lifetime . . . as a compass, transit, level, plumb, alidade and clinometer. *Write for Booklet*

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Nearly 50 years of World wide experience. Modern equipment. Trained crews.

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Anywhere

- Mineral Exploration
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- Mine Drainage Bore Holes
- Large Diameter Holes for Ventilation and Escapeways

PENNSYLVANIA Drilling CO.
DRILLING CONTRACTORS
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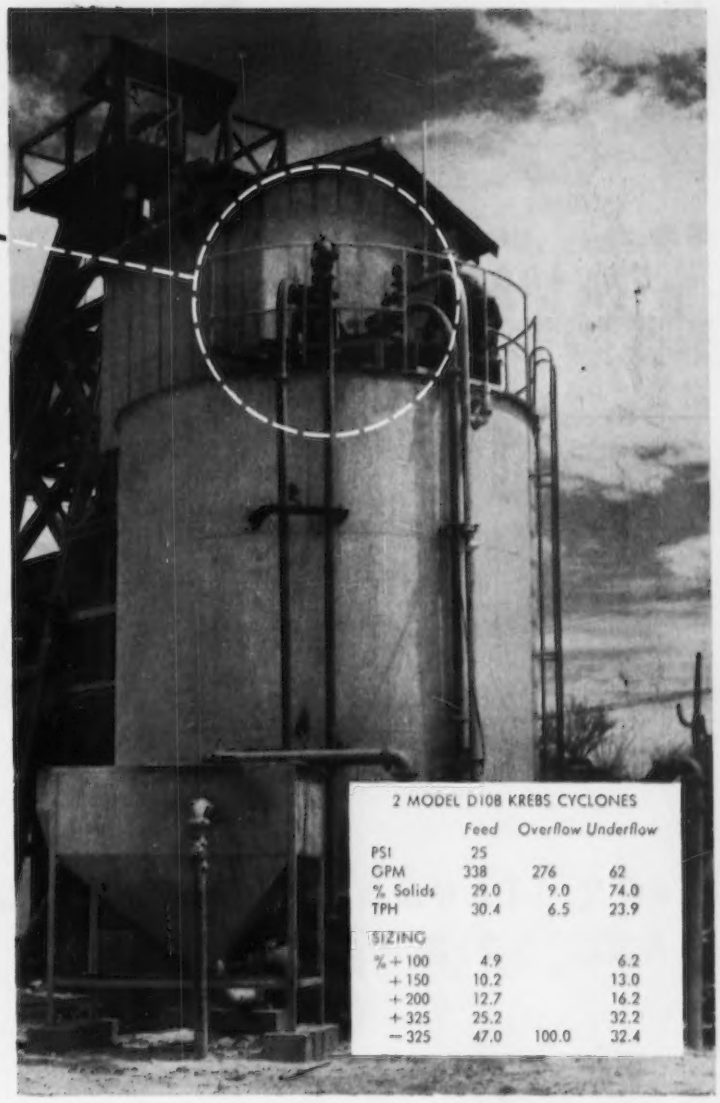

2 MODEL D10B KREBS CYCLONES

	Feed	Overflow	Underflow
PSI	25		
GPM	338	276	62
% Solids	29.0	9.0	74.0
TPH	30.4	6.5	23.9
SIZING			
% + 100	4.9		6.2
+ 150	10.2		13.0
+ 200	12.7		16.2
+ 325	25.2		32.2
− 325	47.0	100.0	32.4

MINE FILL FROM TAILINGS WITH KREBS CYCLONES

At the Banner Mining Company's copper operation near Tucson, Arizona, a sand fill drains sufficiently to drill from in 4 hours and ore is blasted down on the fresh pour the next shift. The fill comes from 2 Krebs Cyclones that produce close to an 80% yield from tailings. Although these tailings are fine and density high, the fill has an excellent percolation rate and set. In mining areas where water is plentiful, dilution is substituted for pressure and larger models of Krebs Cyclones are being used with ideal set and percolation rates.

Send for brochure with photos and performance data on widely diversified applications of Krebs Cyclones.

Bulletin 830

Please fill out and mail.

NAME _____ TITLE _____

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EQUIPMENT ENGINEERS INC.

41 SUTTER STREET SAN FRANCISCO 4, CALIFORNIA

Manufacturers of Krebs Cyclones, Valves and Clarkson Feeders

THE ORE-MASTER

UNDERGROUND DUMP TRUCK

FOR STANDARD HEAD ROOM AND DRIFT AREAS . . .

The Oremaster, a rugged, heavy duty unit, was developed for metal mines with the cooperation of one of the largest mining companies in the midwest.

Having a low height over the side of the dump body permits the use of loaders that cannot be used with conventional height trucks and enables loading over the side or from the end.

The Oremaster has three speeds in either direction (two for loaded use), enabling the heading to be worked without turning the truck around. It is no problem to back into the heading with this unit.

Write for complete details.

ORTRUC MFG. DIVISION
ORTRUC INC., MT. CARMEL, ILL.

REPLY: 320 South Grand, St. Louis 3, Missouri

SPECIFICATIONS

ENGINE — GM Diesel Engine, Model 4-71-4058C

TRANSMISSION—Allison—CT 3340—4 speed Lubrication; Type-Full Pressure Capacity—7.50 Gal.

TORQUE CONVERTER: Allison—TC 420 Single Polyphase 3.00-1 Ratio 4-Element Built-in braking features with Drive line parking brake with brake lock.

CLUTCH: Multiple Disc Type; sintered bronze —Steel core Hydraulic actuated — Automatic wear compensation

COOLING SYSTEM: 7½ gallon capacity — Harrison fin and tube type construction

TIRES: Nylon Rock Grip Excavator—10.00 x 20—14 Ply

BRAKES—Air
Size—16½" x 3" x ⅜"
Type—Timken DPA

SPRINGS—
Length—49 inches
Width—3 inches
Number of leaves—10
Shackle bushings—Bronze
Capacity per springs—5,500 lbs.

STEERING GEAR—Ross TA71
Type—Roller-bearing cam and twin-lever

DIMENSIONS:	feet	inches
Wheelbase		145"
Turning Radius—right (Area to turn 180°—40'x40')	23'	
left	25'	6"
Over-all Length	20'	0"
Over-all width	8'	2½"
Over-all height over highest body point	7'	0"
Loading height (Top of body from ground)	6'	5½"
Wheels and body removed:		
Length	19'	
Width	7"	
Height	5'	
Length of body—inside top		119"
over-all		132½"
Width of body—inside top		92"
over-all		98⅝"
Depth of body—inside front	1'	7"
Road Clearance—minimum		8"
Height of body in dumping position	12'	3½"

SPEED: MPH, loaded
Forward: 4.5—1st; 7.5—2nd; 25.4—3rd
Reverse: 3.4—1st; 5.0—2nd
Maximum speed on a fifteen per cent grade with heaped truck load 3-7 MPH (Maximum recommended for underground)

BODY CAPACITY:
10 Tons—Partial Heaped Load

HOIST—2 Anthony—6" Telescopic, 15 Ton Capacity Weights

	Pounds
Truck Chassis—All Equip	12,300
Body	4,500
Total Weight	16,800

F.O.B. Shipping point—St. Louis, Missouri
90 day warranty on all parts with exception of Engine and Transmission which carry manufacturer's standard warranty.

"Modern Copper Concentrator at Silver Bell, Ariz., for American Smelting & Refining Company"

WHEN THE GOAL IS PRODUCTION

Planning for successful operation begins with preliminary designs and cost estimates. From start to production, assign Stearns-Roger the task—one order, one responsibility for design, engineering, procurement and construction. For new plant or modification,

TAKE IT UP WITH...

Stearns-Roger

THE STEARNS-ROGER MFG. CO. • DENVER, COLORADO

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Stearns-Roger Engineering Company, Ltd., Calgary, Alberta

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Nos. 130-AA, 630-AA and 930-AA
are grease type lubricants especially formulated for use in bearings and on other machine parts subject to heavy loads. Have extremely high film strength, marked adhesiveness and water repellence.

LUBRIPLATE
Nos. 4 and 8
are most satisfactory fluid type lubricants over a wide range of temperatures. Due to their high film strength, they are ideal for use where heavy loads are encountered.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE

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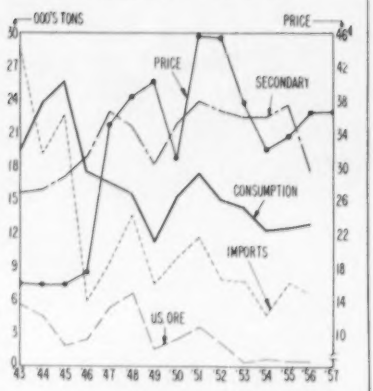
Asbestos *(Continued)*

Philip Carey Mfg. Co., 1935 Easton Blvd., Lockland, Cincinnati 15, Ohio
Raybestos-Manhattan, Inc., Passaic, N. J.
Ruberoid Co., South Bound Brook, N. J.
Russell Mfg. Co., Middletown, Conn.
Southern Asbestos Co., P. O. Box 968, Charlotte 1, N. C.
Standco Brake Lining Co., 2701 Clinton Dr., P. O. Box 93, Houston, Tex.
Tallman McCluskey Fabrics Co., 236 East Monroe, Kirkwood 22, Mo.
Union Asbestos & Rubber Co., 332 South Michigan Ave., Chicago 4, Ill.
U. S. Rubber Co., 1232 Ave. of the Americas, New York, N. Y.
This list is based on U. S. Bureau of Mines information.

Antimony 1943-1957



The price used for the above chart is the average price for the year (1957 estimated) for U. S. produced metal. It is published in *E&MJ* and in *E&MJ Metal and Mineral Markets*. It refers to the price at New York for antimony packed in cases and sold in lots of less than a carload but of at least five tons. The other series in the above chart are based on U. S. Bureau of Mines data. Secondary refers to that produced in the U. S. Imports are of antimony contained in ore and concentrates. U. S. ore is the amount of antimony in ores mined in the U. S. Consumption refers only to primary material of domestic and foreign origin used by U. S. industry.

THE U. S. is the largest consumer of antimony and about two-thirds of U. S. use is of secondary material. Of the primary antimony used, most is imported in ores and concentrates. Domestic antimony ore production is normally only about 10% to 20% of imported ore.

No one industry consumes the bulk of antimony. Antimony used in antimonial lead is probably first, with battery metal usually second. Bearing metal and type metals take a good amount. Among nonmetallic uses frits and ceramic enamels and glass and pottery industries take fair amounts.

Prices for domestically refined antimony metal have been steady this year, but foreign antimony metal 99% grade has sold for 24½c per lb and 99½%

Conveying Troublesome TRAMP IRON

DETRAMP

Stops this saboteur by timely detection and warning

The Detramp electronic iron detector is a simple, inexpensive and reliable means for detecting tramp iron and steel on conveyor belts.

A valuable contribution to automation in mining and milling, Detramp employs a rugged, proven and stable electronic circuit of unique design. Following are some of the features of this versatile system:

Detection signals consist of howler, light and marker or any combination of these devices.

The marker deposits a spot of lime at the location of the tramp material.

Belt normally stops automatically upon detection of tramp metal.

Plug-in delay stop unit and manual over ride switch permits removal of tramp without stopping belt.

Sensitivity adjustment makes it possible to allow small sizes to pass.

Will detect most high manganese steels.

The apparatus is simple to install... gives years of trouble-free service.

Request Bulletin 53-A for full details.

INDUSTRIAL PHYSICS and ELECTRONICS CO.
470 So. 10th East Phone DA 8-8678
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Specialists in instrumentation, control and automation for milling and smelting. Consulting, engineering, design and installation services for all types of system controls.

R T C

REDUCE — TRANSPORTATION COSTS!

Versatile Aerial Tramways are the modern way to reduced hauling costs of ore wastes, concentrates or whatever your product.

Automatic labor-eased terminals provide uniformity of results and lowest per ton labor costs.

Get full information about best available equipment for your project from—

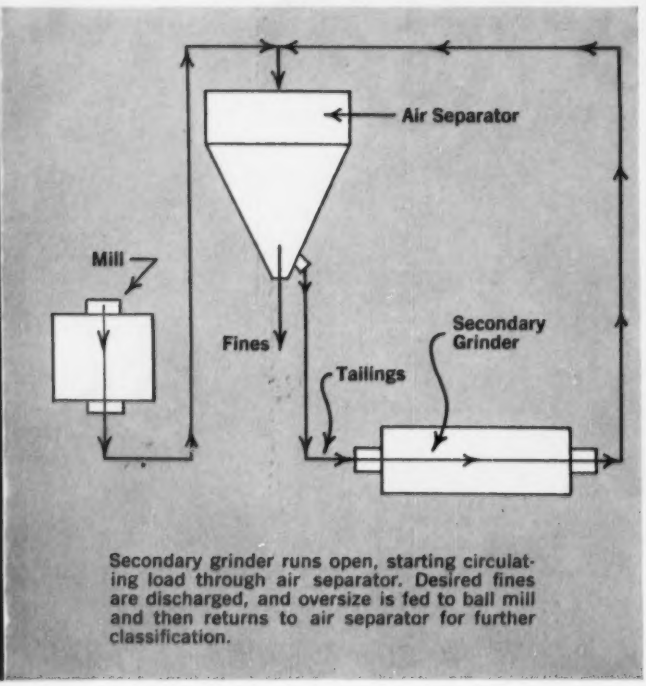
RIBLET TRAMWAY COMPANY

Box 7, Sta. A. Spokane, Washington

Since 1897

Stop Overworking Grinding Mills

FEED SPOUT
Sturtevant Air Separators come in 9 models, diameters range from 3 to 18 ft.
TAILINGS DISCHARGE
FINES DISCHARGE



Secondary grinder runs open, starting circulating load through air separator. Desired fines are discharged, and oversize is fed to ball mill and then returns to air separator for further classification.

LET STURTEVANT AIR SEPARATION HELP YOUR SYSTEM PRODUCE UP TO 300% MORE 40 TO 400 MESH FINES — CUT POWER COSTS AS MUCH AS 50%

Fines that pass through grinding mills unhindered, serving only to increase the work load, can be quickly classified by a Sturtevant Air Separator operating in closed circuit. With all oversize automatically returned for further grinding, the result is production capacity impossible to achieve in single-pass grinding — as well as a better, more uniform product.

Closed circuit grinding and air separation is of proved advantage in *all* secondary reduction processes. Grinding mills are free to perform at top efficiency, their output frequently increased as much as 300% and power costs cut up to 50% (documented by 30 years of Sturtevant air separation experience in the cement industry). Further, attritional heat is dissipated by greater surface exposure.

Sturtevant Air Separators Keep Grinding Units At Peak Efficiency — Classify Feed Loads to 800 Tons Per Hour

Sturtevant Air Separators circulate production loads with exact control of air currents and centrifugal force. Simple adjustments make possible counter-action between the two to the point where a product of almost any desired fineness may be collected while coarser sizes are rejected.

A 16 ft. Sturtevant, for example, took a feed rate of 800 tph, containing only a small percentage of desired fines, and delivered 30 tph 90% 200 mesh, recirculating the oversize through the grinding circuit. (In the cement industry, Sturtevant units deliver up to 60 tph raw cement fines, 40 tph finished cement fines.)

Sturtevant's ability to engineer precise, high capacity classification for closed circuit grinding systems is the result of long experience with a wide variety of dry processes. Sturtevant designed its first air separator some 40 years ago — and has been pioneering developments in centrifugal classification ever since.

Current users of Sturtevant Air Separators include manufacturers of sulfur, soybeans, phosphate, chocolate, feldspar, sand, pigments, limestone fillers, abrasives, plasters, ceramics and cement.

Designed for precise separation of all granular materials, Sturtevant Air Separators have been adapted to other materials as well. Johns Manville, for example, uses a 10 ft. model to separate 3 to 6% undesirable rock from asbestos.

Ruggedly constructed, Sturtevant units are designed for minimum maintenance — at a Midwestern rock-crushing plant, a 10 ft. Separator operates outdoors year-round with only routine care.

For further information, request Sturtevant Bulletin No. 087. Write Sturtevant Mill Co., Clayton St., Boston 22, Mass.

STURTEVANT

Dry Processing Equipment

CRUSHERS • GRINDERS • MICRON-GRINDERS
SEPARATORS • BLENDERS • GRANULATORS
CONVEYORS • ELEVATORS

This operation cut production costs by teaming a six-yard shovel with Mack LVX's (rated capacity, 22½ tons). Powerful engines, increased efficiency of driver-engineered cabs, unmatched handling ease and maneuverability afforded by hydraulic steering and practical transmission ratios with torque converters, and many exclusive features, give Macks faster load-handling characteristics.

Tighter truck schedules reduce production costs

Today, many operators are cutting production costs by using larger shovels and fewer trucks making faster trips. This requires extra-capacity dumpers that are quicker, easier to handle, and rugged enough to withstand five- and six-pass loading—the kind of performance more and more operators find they can get from Mack off-highway dumpers (15- to 34-ton rated capacities).

Why not contact your Mack representative for a look at these big Macks in action on a nearby job? When you see how quickly Macks move extra-capacity loads, how easily they can be spotted under shovels and at dumping sites . . . you'll understand why operators are teaming large-capacity Macks with bigger shovels to cut production costs. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK
first name for
TRUCKS

5335

PLYMOUTH DIESEL

MINE-O-MOTIVE

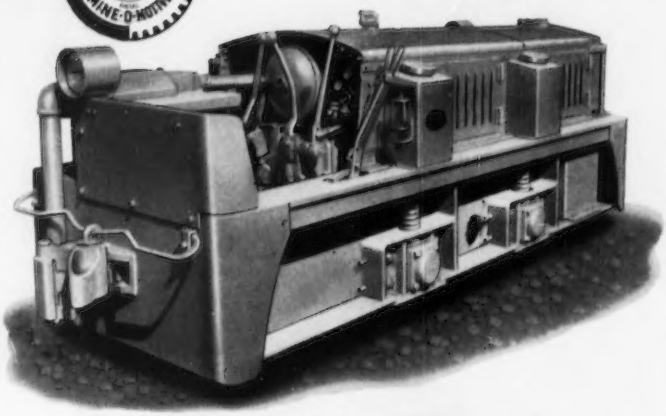
Mine Locomotives 3 to 12 Tons

Engineered expressly for

YOUR LOCOMOTIVE HAULAGE

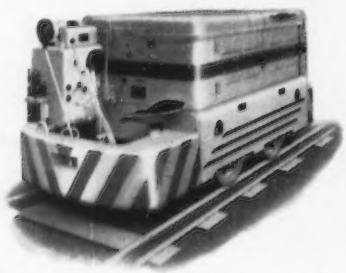
in Today's modern mining operations

You will find these rugged locomotives performing the toughest hauling jobs in mines and tunnels everywhere. Stamina, stability—ECONOMY in performance, SAFETY in operation—and extra years of trouble-free operation—are ENGINEERED in the design and construction of the Mine-O-Motive series. Controls are convenient, simple, safe. Visibility is excellent. And the Diesel-powered models shown have the famous Torqomotive* Drive for easy starting and smooth operation. They supplement Plymouth gasoline, Diesel and Diesel-electric models which have served all industry since 1914—and with lowest ton-mile costs in the field.

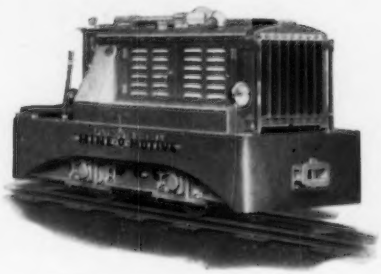


U. S. Bureau of Mines approved exhaust conditioning equipment.

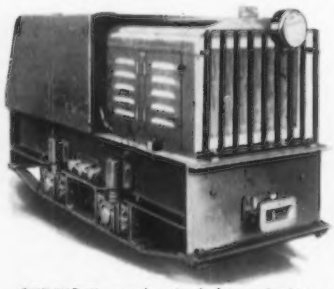
MINE-O-MOTIVE SERIES
Model FMD-00 5 or 6 Tons, Torqomotive* Drive—short wheel base, low center of gravity.



MINE-O-MOTIVE SERIES Model FMD-22 5, 6, 7, 8 or 10 Tons, Torqomotive* Drive (this model approved under Permissible Schedule #22, U. S. Bureau of Mines, for operation in gaseous mines).



MINE-O-MOTIVE SERIES
Model DMD-00, 8 to 12 Tons, with Torqomotive* Drive — low, compact, one-piece welded frame.



SERIES T, mechanical drive, 3, 3½ or 4 Tons. Torqomotive* Drive in 3½ or 4 Tons.

*TORQOMOTIVE DRIVE: Plymouth Transmission coupled to Hydraulic Torque-Converter.

FREE ANALYSIS Send us a brief outline of your hauling operations. An engineering analysis will reach you promptly with latest data on the type and size Mine-O-Motive for the best results in the work you want done.

PLYMOUTH LOCOMOTIVE WORKS

Division of the Fate-Root-Heath Company,
Dept. A-22, Plymouth, Ohio

TISCO®

MANGANESE STEEL CHAIN

COMBINATION CHAIN

TISCO combination chain is made of tough, abrasion-resistant manganese steel for extra long wear. Reinforced side bars provide more bearing area, reduce pin wear and cutting.

PINTLE CHAIN

Used in elevators, conveyors, etc., rugged TISCO pintle chain actually becomes tougher as it wears and is unsurpassed for durability.

DRAG CONVEYOR CHAIN

TISCO drag conveyor chain is noted for its phenomenal wearing qualities and is used for the horizontal transfer of heavy stone, cement, chemicals, etc.

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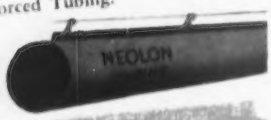

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Antimony *(Continued)*

for 25c delivered in the U. S. Antimony ore prices have dropped considerably in the U. S. and elsewhere.

Recently there was some reduction in Japanese buying of ores. Some factors expect Japanese antimony oxide production to drop greatly. There are suggestions Japanese ore buyers have arranged a buying pool that has contributed to a falling market. Japan has had a scarcity of dollars owing to insufficient exports relative to imports that has limited Japanese imports from some areas.

We are told a number of antimony oxide producers have ceased operations owing to the low price of imported oxide, especially from Germany. There are rumors in the U. S. metal markets much of this material comes from the USSR or its satellites. It is so cheap that it pays to buy the oxide directly (unlike ore, a 1c per lb duty is paid on oxide). Some importers and consumers deny the material originates from behind the Iron Curtain—they claim it is produced in West Germany largely from Turkish ores.

General overproduction of antimony materials is mainly responsible for the low prices. Currently ore prices in the U. S. have dropped below European prices. Last month some hard lumpy ore was sold for use outside the U. S. for $2.55 per long ton unit, f.o.b. Bolivia; European buyers have recently paid as much as $3.10 per short ton unit for 65% ore delivered in Europe. Buyers in the U. S. are no longer willing to pay these prices. In part, the drop in U. S. ore prices reflects the general falling off in metal business.

Antimony Buyers

American Smelting & Refining Co., 120 Broadway, New York 5, N. Y.

Associated Metals & Minerals, 75 West St., New York 6, N. Y.

Hawshaw Chemical Co., 1945 E. 97th St., Cleveland 6, Ohio

Goldsmith Bros. Smelting and Refining Co., 1300 West 59th St., Chicago 36, Ill.

Intercontinental Metal Corp., 607 Fifth Ave., New York 17, N. Y.

McGean Chemical Co., 1040 Midland Bldg., Cleveland 15, Ohio

Mercantile Metal & Ore Corp., 595 Madison Ave., New York 22, N. Y.

Metal & Thermit Corp., 100 Park Ave., New York 17, N. Y.

Metal Traders, Inc., 67 Wall St., New York 5, N. Y.

Nathan Trotter & Co., 36 N. Front St., Philadelphia 6, Pa.

National Lead Company, 111 Broadway, New York 6, N. Y.

Philipp Brothers, Inc., 70 Pine St., New York 5, N. Y.

South American Mineral & Merchandising Corp., 445 Park Ave., New York 22, N. Y.

Southern Lead Co., 2800 W. Moreland St., Dallas, Tex.

C. Tennant, Sons & Co., 100 Park Ave., New York 17, N. Y.

Watson, Geach & Co., 25 Broadway, New York 4, N. Y.

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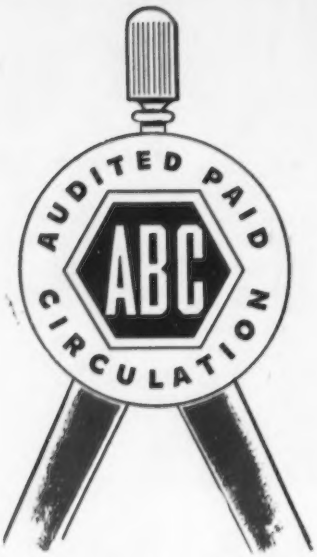

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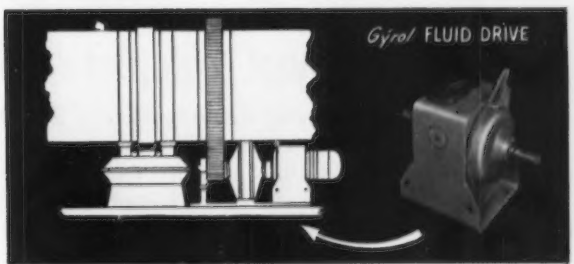

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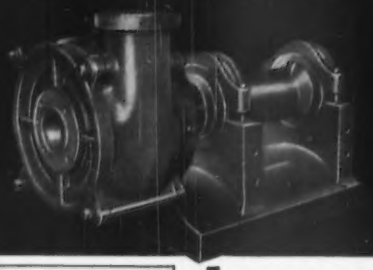

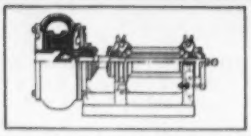

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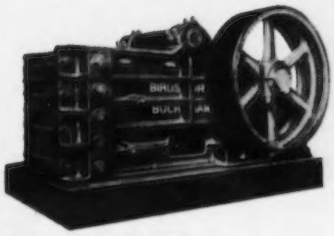

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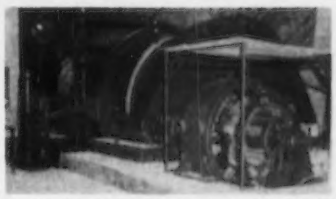

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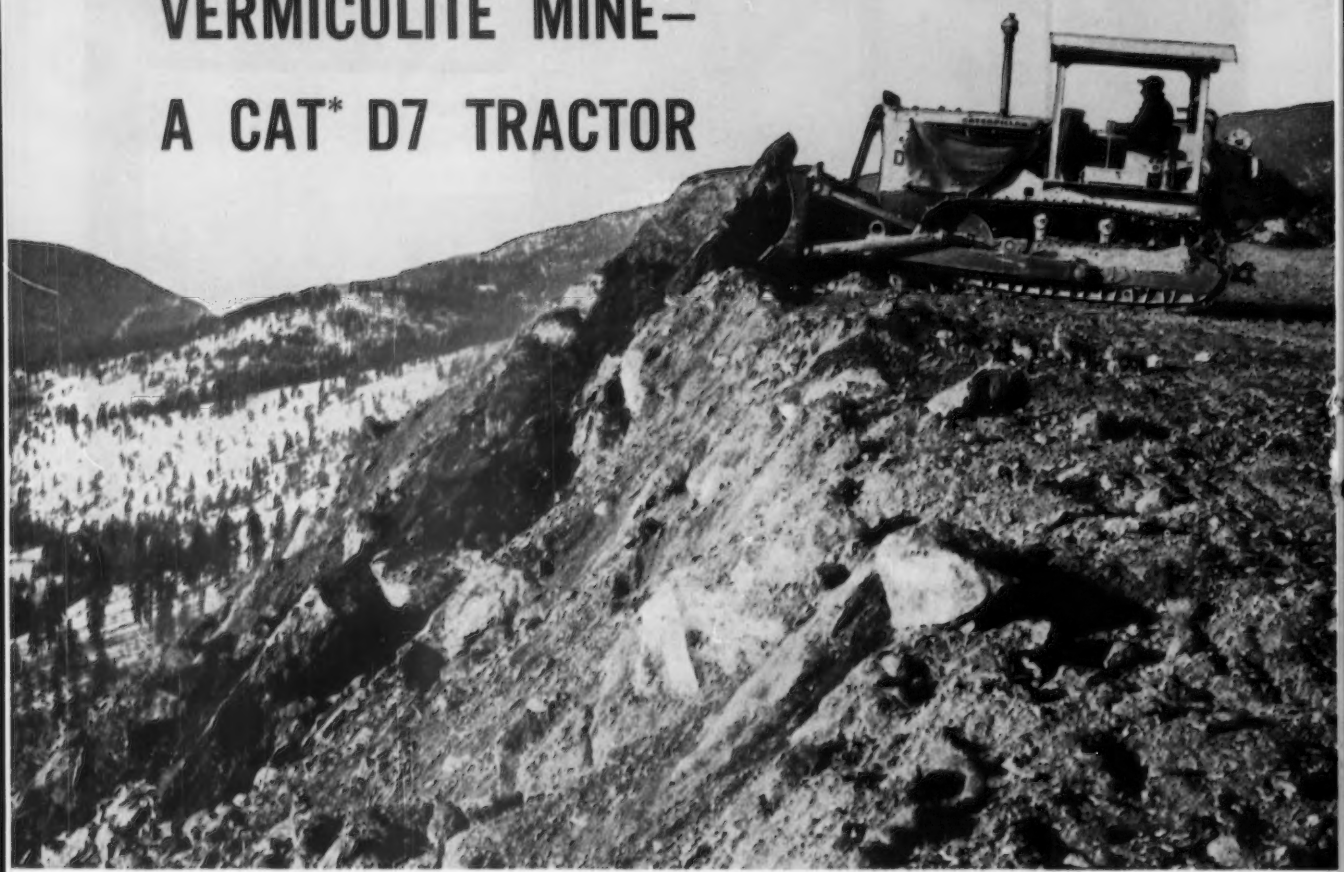

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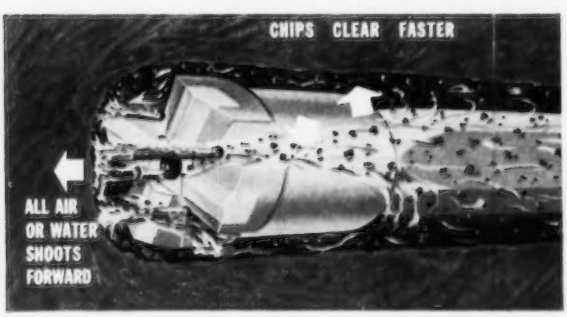

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